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DEVELOPMENTS IN CLINICAL PATHOLOGY.[1]

By A. V. JACKSON,

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THERE have been, in recent years, many developments in clinical pathology, and I cannot attempt to discuss them systematically or in detail. I propose, rather, to give some personal impressions of trends in clinical pathology as I saw it recently in England and America.

At present there are two main lines of approach in pathology. There is the older school of thought which still gets its inspiration from classical Germanic pathology—the tradition of Rokitansky, Virchow and Aschoff. The emphasis here is on careful and thorough post-mortem examinations and on the microscopic study of sections from the autopsies. This method has produced brilliant results in the past, but the stream of original observations is now tending to dry up. Methods of preparing and examining sections have not changed or improved very much in the last fifty years, and it is becoming more and more difficult to discover anything that has not been observed before by the simple process of looking carefully at tissues with the naked eye and the microscope. However, this approach has been given a new lease of life recently by the introduction of some new instruments and new techniques. When the difficulty of preparing sufficiently thin sections has been solved, the electron microscope should reveal intracellular detail quite outside the range of the ordinary light microscope. Even the electron microscope may be replaced soon by the X-ray microscope, because with this instrument the sections do not need to be quite so thin, nor do they have to be mounted in a vacuum as they do with the electron microscope. Phase contrast illumination is useful in distinguishing between cellular components of similar refractive index. X-ray diffraction studies are giving information about the molecular structure of intracellular and extracellular proteins. More specific staining methods—such as the Feulgen reaction for desoxyribonucleoprotein—are creating a new science of histochemistry. All these new techniques are reawakening interest in morbid histology and the old Germanic pathology is being rejuvenated.

The other approach in pathology is the experimental approach and there is often definite and open rivalry between the exponents of the two points of view. The experimentalist thinks that the morbid anatomist's knowledge of a disease process is limited to the one cross-section he happens to see at one arbitrary point in the natural history of the disease. The experimental pathologists take as their province the whole process of disease and they study both Nature's experiments in humans and controllable experiments in animals. The recently appointed head of the School of Pathology in Birmingham has actually been given some beds in the hospital where he will study "living" pathology. It is a novel idea, though perhaps some of the patients may be disturbed to find that they have been allotted to the department of pathology. Now, the clinical histologist—the man who examines the surgical biopsies—is in the first of these two camps and the only methods he can use are those of the morbid anatomist. Experimental methods cannot help him. Moreover, the newer techniques I mentioned—the electron microscope, even histochemistry—are not yet standardized for him to use in a routine way. He has been strictly limited to paraffin and frozen sections and has been regarded with a certain amount of scorn by his more "pure" pathological

[1] Read at a meeting of the Victorian Branch of the British Medical Association on July 6, 1949.

colleagues, and that is one of the reasons why a new method—the use of smears instead of sections—has been so enthusiastically and sometimes uncritically adopted.

One has to admit that, apart from frills, the main function of the histopathologist is to assist the surgeon to confirm or exclude malignant disease. He may give fancy names to enlarged lymph glands, he may examine aspiration biopsies of cirrhotic livers, but his first responsibility is to say whether or not material sent to him is cancerous. In some organs, such as the stomach or lung, it may be very difficult to get a specimen for biopsy. In a carcinoma of the lung, for instance, the tumour may be out of reach of the bronchoscope. In the kidney it is impossible without operation. It is held that the smear method may help in some of these cases.

In this method, instead of paraffin or frozen sections of solid tissue, smears are made of material which is aspirated or has been excreted from bronchus, cervix or stomach or other organ. After being stained the smears are examined for malignant cells. In America this is given the fine-sounding title of "exfoliative cytology"—that is, the study of cells which have been shed or exfoliated from the surface of a growth. The emphasis is on cytology rather than on histology, because though the smears may contain clumps of cells large enough to show some tissue structure, usually they are all separate and the diagnosis must be based on cytology.

This method is being most enthusiastically exploited in America. Millions of dollars are available for cancer research and more millions are being spent on anti-cancer propaganda. The propaganda urges the lay public to seek early treatment, and as the emphasis is on early treatment, so much of the research concentrates on ways of improving early diagnosis. In nearly every medical centre I saw in the States at least one team was working with cancer research funds on exfoliative cytology.

Of course, the method is not really new. American interest commenced with Papanicolaou at Cornell in 1942, and his name is now commonly associated with the method. Bronchial secretions are often sent to the laboratory labelled "Washings for Pap.". However, before this—back in 1934—Dudgeon in England reported that he was able to demonstrate malignant cells in sputum from 68% of cases of proven bronchogenic carcinoma. For some time he had been studying the cytology of cancer by making smears from the cut surface of tumours removed at operation or post-mortem examination, and from this he was led to its use in clinical diagnosis. As early as 1887, Hampeln in Germany described cancer cells in sputum, and ever since many pathologists have occasionally used the method.

The main difficulty about the smear method is that it is cells—individual separate cells—which have to be examined instead of pieces of solid tissue in which the tissue pattern can be seen. Some malignant features, such as mitoses, bizarre and deeply staining nuclei, are purely cytological. But the trouble is that mitoses may be seen also in quite benign but rapidly growing tissue, and nuclear variation may be marked in degenerating but benign lesions. And so, before deciding that a section is malignant, the pathologist likes to see invasion of surrounding tissue and to see gross departure from the normal tissue pattern. Also, many of the exfoliated cells are necrotic and have lost much of their cytological detail, and this adds to the difficulty of interpretation.

However, the method must be judged not on inherent difficulties but on results. Good results have been claimed for its use in the urogenital system, the stomach and the lung.

Carcinoma of the Uterus.

Smears can be made from either vagina or cervix. Rather extravagant claims have been made that these smears will reveal cancer from anywhere in the genital tract. It is said that malignant cells cast off from endometrium, tube or even ovary eventually pass out through the cervix, and can be found in the vaginal mucus or in the outside of the cervix. However, it is admitted that tumours of Fallopian tube or ovary can be only very occasionally detected in this way. As for carcinomata of fundus or cervix, I feel sure that the method is not as reliable as the standard examination of an ordinary surgical biopsy of the cervix, or curettings from the fundus. These are, of course, difficult sections—the ones in which the pathologist has to say: "I'm not really sure. I think it is a carcinoma, but it may just be benign hyperplasia." I find it difficult to believe that the smear will help in this type of case. And yet some enthusiastic cytologists speak of a characteristic "preinvasive cancer cell" and with some confidence diagnose preinvasive carcinoma of the cervix before there is any definite cervical lesion that can be seen with the naked eye. Some of these so-called cancers are, they admit, "reversible"! This uncritical enthusiasm is leading to unnecessary hysterectomies and is bringing the technique into disrepute. In spite of this, the method has been widely publicized (even in the lay Press) as a means of screening for uterine cancer.

Carcinoma of the Urinary Tract.

As with the uterus, carcinoma of kidney, ureter, bladder and prostate can occasionally be diagnosed by examining smears of centrifuged deposit from the urine. However, the routine methods—cytoscopy, pyelography *et cetera*—are quite satisfactory and the smear is unlikely, I think, to replace or to supplement them. After a prolonged trial at the Mayo Clinic, the method is no longer being used to any great extent. Smears of prostatic fluid may be used in suspected prostatic carcinoma. However, Herbut in Philadelphia told me that even after considerable experience he was still able to detect only those which were rather obvious on clinical grounds, and he had many "false negatives". In addition there is the possibility that prostatic massage may be a dangerous procedure in carcinoma of the prostate, because of the danger of forcing cells out into the circulation and perhaps causing metastases.

Carcinoma of the Stomach.

The early diagnosis of carcinoma of the stomach is, of course, difficult, and any assistance here would be invaluable. Unfortunately, results of smears have been disappointing. Both fasting contents and gastric washings have been used with occasional positive results, but gastric digestion of the exfoliated cells rapidly destroys cytological detail, and interpretation of smears is so difficult that the method is not yet really practicable.

Carcinoma of the Lung.

In carcinoma of lung I think the smear is worth while. When a ca- oma is within reach of the bronchoscope an ordinary opsy may be done; but when it is further out in the lung, particularly in the upper lobe, it may be suspected by the surgeon, but the suspicion may not be strong enough to justify thoracotomy unless the pathologist can give some extra help—and that is where the smear may be useful. In a recent series of 58 cases of bronchogenic carcinoma, Woolner at the Mayo Clinic found that 54% could be diagnosed before operation by bronchoscopic biopsy. In a further 43% cancer cells in sputum or bronchial aspiration provided the only microscopic evidence of malignancy. In this series there were two "false positives"—that is, in two cases no carcinoma was found at operation. Liebow at Yale obtained comparable results and was able approximately to double the number of positive pre-operative diagnoses by using bronchial or sputum smears in addition to attempted biopsy.

I could quote similar figures from other laboratories, but I personally saw more of the work of Woolner and Liebow. They were very frank about their occasional "false positives", but at the same time were quite sure about the real contribution this method can make to thoracic surgery.

However, it is important to realize that the method is not easy. A lot of experience is needed before results will be reliable. The criteria used in making the diagnosis differ from those used in paraffin section work. Long experience in routine histopathology does not automatically make one competent in cytopathology—in fact it may even be an initial handicap. One has to set out afresh to learn just what are the minimal requirements for the making of a diagnosis on a smear. At the Mayo Clinic Woolner

and his associates spent a whole year examining bronchial and sputum smears from controls and proven carcinomata before they felt confident; and even still, of course, they make occasional mistakes. His team can reach and maintain such proficiency only because they are continually at this work. Twenty minutes are required, they say, for thorough examination of a single sputum smear before a negative report is given. The regular staff of a routine Australian laboratory could not afford this time. However, I think there should be at least one trained team (of, say, two full-time technicians and a part-time pathologist) available somewhere in Melbourne to serve the several thoracic surgery units operating here.

Just a word about other biopsy techniques. Some pathologists in England and America favour the use of aspiration biopsy. They use it for undiagnosed lumps in the breast, for enlarged lymph glands, even for deep-seated tumours in the chest or abdomen. However, the amount of material obtained, even when a large bore needle is used, is often insufficient for diagnosis. Also, when deep-seated tumours are aspirated, the method is not free from risk, and fatalities have occurred from hæmorrhage. And so most workers now use it only for confirming the nature of superficial metastases—for example, in lymph glands or skin nodules—in patients with an already proven primary tumour.

In some laboratories frozen sections are used as a routine. At the Mayo Clinic all surgical biopsies are cut as immediate frozen sections and paraffin sections are seldom if ever used. However, what I saw of the work there did not shake my belief that though the frozen technique is rapid and dramatic, it is not so efficient and reliable as the routine paraffin methods.

I would like now to mention briefly a few new methods in the other branches of clinical pathology.

Bacteriology.

The laboratory diagnosis of pulmonary tuberculosis is under review at present. Mass radiography is detecting many early and doubtful pulmonary lesions and bacteriological confirmation in these cases is of obvious importance. Until recently the routine stain for sputum has been the standard carbol fuchsin Ziehl-Neelsen method, but this is now being replaced by fluorescent dyes and the use of ultra-violet light for examination. I know this is not new to you, but I mention it because I was pleased to see that in this respect we are well to the fore in Australia. It has been a routine procedure here in some laboratories for several years, whilst in England and America it is only just now coming into use.

Methods of culturing sputum for tuberculosis are also being improved. The usual media contain egg or other food of variable and unknown chemical composition, and it is impossible to standardize them so that comparable results can be obtained in different laboratories. Dubos, at the Rockefeller Institute in New York, has shown that the tubercle bacillus is not, as used to be thought, very fussy about its food. On the contrary it will grow on very simple media—media so simple that they will not support the growth of even hardy organisms like staphylococci or *Bacterium coli*. His media are not yet 100% satisfactory, as they allow the growth of fungi which may contaminate the sputum and overgrow the cultures; but I do not think there is much doubt that the media which will be used in the future will be along the lines that Dubos has indicated—that is, media whose chemical composition is accurately known and readily controllable.

Methods of concentrating the sputum before inoculation onto media or into guinea-pigs also need improving. At the last meeting of the British Society of Clinical Pathologists, R. Cruickshank said that the usual concentration methods in which strong alkali or strong acid is used, were too severe, and that only about 1% of the tubercle bacilli in the sputum survived the treatment. He tested another method, in which ferrous sulphate and hydrogen peroxide were used. Used in parallel with other methods, it gave very much better results.

Dubos made an interesting suggestion. He believes that sputum is best treated not by strong inorganic chemicals, but by enzymatic digestion. It could be digested, he thought, by a mixture of mucinase and streptokinase. Streptokinase is a product of certain streptococci and it contains, or produces, both fibrinolysin, which will digest fibrin, and also streptodornase, which will digest desoxyribonucleoprotein. (Dornase is a shorthand term for desoxyribonuclease.) The stickiness of thick pus is due to nucleoprotein from the nuclei of dead polymorphonuclear cells, and it can be rapidly converted into a thin fluid by treatment with streptodornase. Incidentally this has very promising clinical applications. At a staff meeting at the Rockefeller Institute, Tillett showed a number of patients who had had old abscesses which could no longer be aspirated because of the thickness of the pus, and because of fibrous loculations. The majority were empyemata of the pleura or nasal sinuses. Streptokinase was injected into the cavity, and after an interval the contents could be aspirated as a thin fluid, and the condition then responded to chemotherapy without open operation which would have been otherwise necessary. The streptokinase is non-toxic and no harmful effects followed its use. So far it has been produced only on a laboratory scale, but large-scale commercial production is now being attempted. It has also been used along with streptomycin for thecal injection in tuberculous meningitis, and the results appear to be better than with streptomycin alone.

Hæmatology.

In hæmatology techniques are changing rapidly, but I can mention only a few. The photoelectric cell is now being widely used to reduce personal error in hæmoglobin estimation, and it is also now coming into use for red cell counts, the opacity of a dilution of the blood being compared with a standard suspension.

For bone marrow smears some hæmatologists in England and America are now using the iliac crest, or one of the vertebral spines instead of the sternum. After all, for a nervous patient it is rather upsetting to have a large needle thrust into the chest in what he imagines is the direction of his heart. With practice it is just as easy to get marrow from the ilium or vertebra as from the sternum, and the patients prefer it. Castle in Boston said that he had entirely given up sternal puncture and was using the iliac crest.

Irregularities and inconsistencies in reticulocyte counts may be due to variation in the cresyl blue which has been used. The Navy laboratory at Bethesda in Maryland found that different batches of cresyl blue differed in their absorption spectra and they gave different reticulocyte counts with the same sample of blood. They found that another aniline dye—"new methylene blue"—had much more consistent physical properties, and gave very regular reticulocyte counts; and they recommend its use in place of cresyl blue.

A new blood test for Addison's disease is advocated by Loeb and his associates at the Presbyterian Hospital in New York. They found that, in normal controls and in all diseases they tested except Addison's, injection of adrenocorticotrophic hormone is followed by a decrease in the eosinophile cell count down to at least 50%, and often to less than 10% of the preinjection level. In Addison's disease there is no change or only a slight drop. At a meeting of the American College of Physicians this year Loeb said he was satisfied that this is the most reliable single laboratory test for Addison's disease. The Medical Unit at Harvard has had similar success with it.

Biochemistry.

Biochemistry is rather out of my province, but I would like to mention one instrument which is in the news. The flame spectrophotometer is not a new instrument, but its use in clinical biochemistry is fairly recent. It is used for the rapid estimation of sodium or potassium. A knowledge of what is happening to sodium and potassium is of great importance in the control of patients showing upset in water balance in such varied conditions as Addison's disease, diabetes, intestinal obstruction, extensive burns and so on. Standard titration methods are reliable, but are very time-consuming, and the results may not be available quickly enough to allow the assessment of the rapidly changing mineral and water requirements of a

sick patient. Laboratories are often forced to make an indirect and only approximate assessment of sodium level by using the much easier and quicker titration of chloride in the blood, or they may even simply test for the presence or absence of chloride in the urine. With the flame spectrophotometer, sodium or potassium can be estimated very rapidly. The principle of the instrument is fairly simple. The solution whose sodium content is to be estimated is fed at a controlled rate into a gas flame and the characteristic yellow sodium spectrum is emitted. The strength of this light is proportional to the strength of the sodium solution, and is measured photoelectrically after passage of the light through a filter which absorbs everything except the yellow sodium band. With a suitable filter potassium can be estimated in the same way.

In practice it is not so simple. There are many technical difficulties, and the instrument is not yet one which can be left to technicians in a routine laboratory. However, if it can be simplified and made more technically foolproof, it may eventually be a very useful routine instrument.

Conclusion.

That is about all I have to say. Most of it has been about technical methods—but, of course, the actual performance of tests is not the most important function of the clinical pathologist. Fifty years ago—and less—it was still quite possible for the clinician to have a working knowledge of all laboratory tests. Nowadays this is impossible and the person who can best bridge the widening gap between clinician and technician is the medical graduate clinical pathologist. An article in *The Lancet* of January 22, 1949 (page 154), contained the following statement: "The pathologist is now at a critical crossroad. Much of his work is becoming standardized so that relatively inexperienced laboratory staff can report with a plain yes or no." If taken literally this statement is most misleading. Even such common tests as the Wassermann, liver function tests and sedimentation rate determinations are largely empirical and their interpretation will often require consultation between physician and clinical pathologist. Even when the technician's answer can be given in figures—say, a blood urea content of "45", or a red cell count of "4,000,000"—the answer to the clinician's query, "Is this normal or abnormal", is not *The Lancet's* "yes" or "no", but should be expressed in probabilities, not certainties, that is to say, a blood urea figure of "45" is not necessarily "abnormal", but has, say, a 5% chance of being normal.

And so it is essential that developments in technique must be accompanied by corresponding developments in interpretation; and the more specialized the technician becomes, the more important is the role of the clinical pathologist as liaison officer between laboratory and ward.

CARBON DIOXIDE THERAPY IN CLINICAL MEDICINE.

By VICTOR WYNN,
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THE aim of this paper is to show the technical fallacies of present clinical methods of carbon dioxide administration and to discuss briefly the indications for the use of carbon dioxide therapy. Suggestions are made for improving the methods of carbon dioxide administration based upon a consideration of the experimental results.

The commonest purposes for which carbon dioxide is administered are (*a*) to resuscitate asphyxiated patients, (*b*) to stimulate deep breathing following operations.

Physiological Considerations in the Use of Carbon Dioxide in Asphyxia.

The type of asphyxia for which carbon dioxide is generally considered to be a valuable therapeutic agent is that following the inhalation of an inert gas. A common example of this is carbon monoxide poisoning. This type of asphyxia is associated with a low partial pressure of carbon dioxide in the arterial blood (acapnia). The carbon monoxide combines with hæmoglobin to form a stable compound—carboxyhæmoglobin. Anoxæmia results, and this causes hyperventilation which washes out excessive amounts of carbon dioxide from the blood. When the plasma level of carbon dioxide falls there is a compensatory lowering of plasma bicarbonate concentration (acarbia). This is one of the mechanisms maintaining homœostasis as far as plasma pH is concerned, according to the Henderson-Hasselbach equation: $\frac{(H_2CO_3)}{(B.HCO_3)}K=(H^+)$. The finding of a low-alkali reserve in such a patient is evidence of a compensated respiratory "alkalosis", and not of "acidosis" as is commonly assumed. There is therefore considerable justification for using carbon dioxide inhalation therapy in such a case in order to restore the depleted carbon dioxide of the plasma. This will provide an adequate chemical stimulus on which the respiratory centre largely depends. Carbon dioxide has been given in 10% concentration with oxygen by a specially designed mask and good results are recorded in cases of carbon monoxide poisoning (Henderson, 1938). Carbon dioxide also has a specific

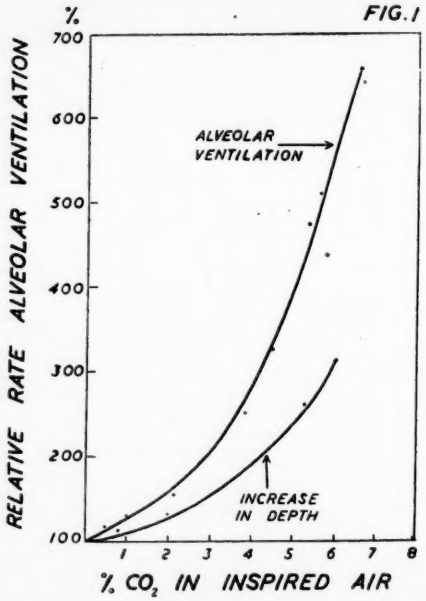

FIGURE I.

effect in causing the dissociation of carboxyhæmoglobin (Haldane and Priestly, 1935), and this is further justification for its use. It has been claimed (Henderson, 1938) that the use of pure oxygen in this condition may be dangerous. When the carbon dioxide concentration in the plasma is very low the respiratory centre receives its drive through the carotid bodies, themselves stimulated by anoxæmia. The giving of oxygen alone may stop the stimulus to the carotid bodies, which then fail to drive the respiratory centre, which is itself deprived of its natural stimulus, carbon dioxide, and fatal apnœa may result. This effect, the "oxygen-apnia of Mosso", has been observed in other conditions in which low carbon dioxide partial pressure and anoxæmia coexist. It has been observed at high altitudes and in some cases of pneumonia in which over-breathing has been prolonged. In both these conditions the addition of carbon dioxide to the inspired air is a rational procedure (Henderson, 1938).

In other types of asphyxia, however, carbon dioxide seems to be contraindicated. In obstructive asphyxia (drowning, for example) and when the respiratory centre is depressed by narcotics, the blood contains carbon dioxide at greater than normal partial pressure (Henderson, 1938; Eastman, 1936; Grodins *et alii*, 1946; Comroe and Dripps, 1946), and therefore to add further carbon dioxide to the blood may be dangerous. There is, however, a situation which may occur with this type

of asphyxia for which carbon dioxide therapy is indicated. There is a danger which exists with some types of mechanical respirators that prolonged artificial respiration may wash out excessive quantities of carbon dioxide, producing a marked lowering of carbon dioxide in the blood (Comroe and Dripps, 1946). This situation deprives the respiratory centre of its natural stimulus and consequently natural breathing is not recommenced. To avoid this 5% to 7% carbon dioxide in oxygen should be given. There is no danger, however, with either the Shaeffer or Sylvester methods of artificial respiration of causing over-ventilation. It is not sufficiently recognized that in the flaccid patient both these methods produce very little pulmonary ventilation. There is some evidence that Eve's rocking method may cause over-ventilation and if this method is prolonged "Carbogen" should be given (Comroe and Dripps, 1946).

Physiological Considerations in the Post-Operative Use of Carbon Dioxide.

It is in the artificial production of deep breathing following operations that carbon dioxide achieves its widest clinical application. It is necessary to consider the various theories which have prompted its use. It was advocated first by Yandell Henderson to combat post-operative "shock". He believed

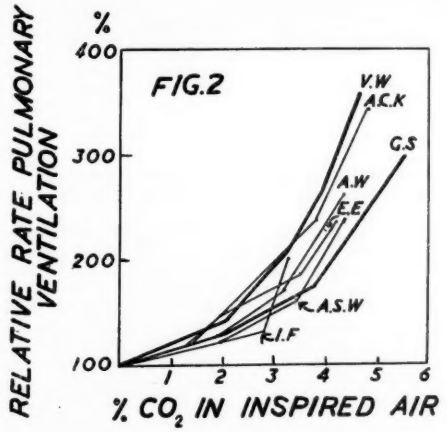

FIGURE II.

that this condition resulted from a low plasma carbon dioxide content (acapnia) with a compensatory reduced bicarbonate content (acarbia). The mechanism producing this is similar to that already described in carbon monoxide asphyxia. The patient over-breathes owing to nervousness prior to the anæsthetic, this is maintained by the stimulating effect of the anæsthetic upon the respiratory centre, carbon dioxide is washed out, and acapnia is produced. Henderson claimed that carbon dioxide given to patients showing post-operative shock also relieved anoxæmia, improved the blood pressure, improved muscle tone including the tone of the diaphragm, hastened the elimination of the anæsthetic agent, and reduced the incidence of post-operative nausea, gas pains and atonic conditions of the bowel—all these conditions being made worse by, and in part dependent upon, acapnia.

There was very wide opposition to the acapnia theory of shock and there was a genuine belief that the post-operative state was one of "acidosis". Post-operative carbon dioxide inhalation therapy remained a doubtful procedure until about 1930. Coryllos and Birnbaum (1929) reintroduced an enthusiasm for post-operative carbon dioxide inhalation for an entirely different reason. They demonstrated that the much dreaded post-operative pulmonary complications of atelectasis, massive pulmonary collapse, and pneumonia, were caused by bronchial obstruction due to mucus. Mucus failed to drain from the lungs owing to the patient's shallow breathing, his immobilization (frequently in a semi-vertical position), the atony of the diaphragm, and failure to cough. Artificially induced deep breathing was suggested as a useful way of preventing this stagnation and thus of lessening the incidence of post-operative chest complications. Carbon dioxide inhalation therapy then achieved a certain popularity and in many clinics is still a routine post-operative measure. There is a widespread belief, however, that it has failed to achieve worthwhile results. The reason is that it is generally given in a haphazard way without reference to the minimum requirements which could make this a successful therapeutic procedure. *It is necessary to decide:* (*a*) what increase in breathing will prevent stagnation of mucus in the lungs, (*b*) what level of carbon dioxide concentration is necessary to produce this increase, (*c*) how this can be achieved with the methods available. In the absence of reliable experimental and clinical information the answer to (*a*) can be only an approximation. I have assumed that one must produce at least 100% increase in depth of breathing before worthwhile aeration of the dependent and peripheral portions of the lungs will be achieved. The second criterion will be arrived at by examining some physiological facts. Figure I is a graph of the published results of Campbell *et alii* (1913) relating the increase in alveolar ventilation rate to rising concentrations of carbon dioxide in the inspired air. To double the rate of alveolar ventilation it is necessary to maintain a 3% carbon dioxide concentration in the inspired air. However, the respiratory rate rises with carbon dioxide stimulation (Figure III) and hence the depth of breathing will not be doubled until about 4%

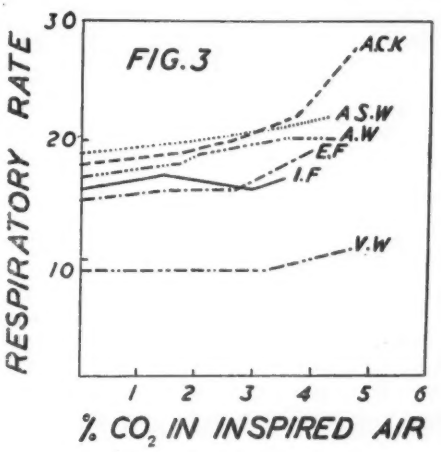

FIGURE III.

carbon dioxide concentration is reached (Figure I, curve derived from results published by Haldane, 1935). There is in addition a considerable individual variation in sensitivity to carbon dioxide stimulation. Figure II shows this effect. It graphs the observed increase in pulmonary ventilation produced by varying concentrations of carbon dioxide in normal students. In normal people, then, one may expect to double the depth of breathing by using a 4% to 5% concentration of carbon dioxide. In patients under the influence of narcotics, the respiratory centre may be less sensitive to carbon dioxide and it may be necessary to push the concentration even higher—and 10% concentration has been given safely (Henderson, 1938). Once adequate hyperventilation starts the concentration can be reduced and it is probably not necessary to produce more than one minute or two of deep breathing. This should be repeated every hour until the patient will cooperate voluntarily.

The third problem under consideration, namely, how to provide adequate carbon dioxide concentration by the generally available methods, was investigated by a series of experiments.

Experimental Procedures.

Carbon dioxide administration by oxygen tent and by intranasal catheters was investigated. These are the commonest clinical methods. Masks are rarely used as a routine, although special clinics have them. A simple "demand" mask system is described.

The Oxygen Tent.

The common conical oxygen tent made of cloth, with a celluloid window and an inlet at the top, was investigated. It was desired to find out how various factors influenced the concentration of

carbon dioxide in the tent. At the same time some observations were made upon the effect of known carbon dioxide concentrations when given by this method upon the pulmonary ventilation of healthy young males. Medical students were used as experimental subjects. Cylinders of "Carbogen" were used to provide the carbon dioxide atmosphere. The stated composition of the cylinder was verified by the Haldane method of gas analysis. This method was used to determine the carbon dioxide concentration within the tent.

The subject of each experiment reclined on a couch. The tent was placed over his head and either compressed air or "Carbogen" was allowed to flow into the tent from the inlet at the top. The bottom of the tent was sealed in two ways. The flaps were tucked in around the patient and this is referred to as the "open" tent. To find out the effect of this inadequate sealing of the tent two blankets were folded around the base of the tent. This is referred to as the "closed" tent. With both the closed and the open tent 5%, 7% and 10% "Carbogen" was allowed to flow in at various rates from 15 to 30 litres per minute. Tent samples were obtained at stated time intervals up to ten minutes. These samples were sucked out of the tent through a catheter held at the mouth level into rubber bags—the sampling took half a minute.

TABLE I.
Influence of Time on Carbon Dioxide Concentration in the "Closed" Tent. Rate of flow, 15 litres per minute.

"Carbogen."	Percentage of Carbon Dioxide in Tent Sample.		
	One Minute.	Four Minutes.	Seven Minutes.
5%	1·6	1·9	2·3
7%	2·9	3·2	3·3
10%	4·4	4·8	4·9

In order to make observations upon pulmonary ventilation rates under carbon dioxide stimulation the subject's expired air was collected and measured. With nose clipped the subject breathed through a Douglas respiration valve and the expired air was collected in a Douglas bag outside the tent. In this way the expired air was prevented from entering the tent and consequently by referring to the result of the previous experiments it was possible to determine what contribution to the carbon dioxide in the tent was normally made by the patient's own expired air (Table IV). At three-minute intervals the volume of air collected in the Douglas bag was measured. When this was steady basal conditions were presumed to be reached. The carbon dioxide concentration was raised and at each level the subject was allowed ten minutes to achieve equilibrium. Then the three-minute respiratory volume was collected.

TABLE II.
Influence of Rate of Flow on Carbon Dioxide Concentration in the "Closed" Tent.

"Carbogen."	Percentage of Carbon Dioxide in Tent Sample.		
	With Flow of Eight Litres per Minute.	With Flow of Fifteen Litres per Minute.	With Flow of Thirty Litres per Minute.
5%	1·9	2·3	3·1
7%	2·7	3·3	4·1
10%	3·6	4·9	6·1

Results.—The carbon dioxide concentration in the closed tent at 15 litres per minute flow reached its maximum in about five minutes (Table I).

Table II shows that the carbon dioxide concentration in the tent is considerably influenced by the rate of flow of "Carbogen". At eight litres per minute it is about 38% of the concentration of the inflowing gas, at 15 litres per minute it is about 50% and at 30 litres per minute about 60%.

Table III shows the difference in concentration in the closed and open tent at 15 and 30 litres per minute flow. The concentration in the open tent is 20% to 30% less than that in the closed tent.

Table IV indicates the carbon dioxide concentration in the closed tent at 15 litres per minute flow when the subject's expired air is collected. It shows that the patient's expired air contributes about 20% to 30% of the total carbon dioxide in the tent.

Figure II shows the relative increase in pulmonary ventilation with increasing concentration of carbon dioxide. It shows the same type of curve as in Figure I. The wide individual variation in sensitivity to carbon dioxide is revealed.

TABLE III.
Influence of Inadequate Sealing upon Tent Concentration at 15 and 30 per Minute Flow of "Carbogen".

"Carbogen."	Tent.	Percentage Concentration in Tent.	
		Fifteen litres per Minute Flow.	Thirty litres per Minute Flow.
5% ..	Open ..	1·9	2·5
	Closed ..	2·3	3·1
7% ..	Open ..	2·5	3·2
	Closed ..	3·3	4·1
10% ..	Open ..	4·3	4·8
	Closed ..	4·9	6·1

Figure III is the graph of respiratory rate under carbon dioxide stimulation. It shows a general tendency for the rate to increase.

The Practical Significance of the Results.—By adequate sealing of the tent and use of a flowmeter it is a simple matter to provide a predictable concentration of carbon dioxide in the tent. At 15 litres per minute flow the concentration is about 50% of the influent after five minutes and at 30 litres per minute it is 60%. A 5% "Carbogen" mixture is the mixture routinely used in the wards of public hospitals. It is impossible to get a therapeutic level of carbon dioxide in a tent with this gas. "Carbogen" 10% is capable of giving concentrations up to 6% in the tent, and should replace the 5% mixtures. It must be understood that the tent fabric is freely permeable to the atmospheric gases and moreover the patient's respiratory movements would aid mixing through the cloth walls of the tent. This explains the great diluting factor in this method. The physiological principles determining the desirable carbon dioxide level in a variety of clinical conditions have been discussed in the opening section. These concentrations can be obtained by using a tent in which adequate sealing precautions are taken, and also 10% "Carbogen" and a flowmeter capable of providing an adequate rate of flow.

TABLE IV.
Tent Concentrations at 15 per Minute in Closed Tent when Subject's Expired Air is Collected. (Compare with Table II.)

"Carbogen."	Percentage.
5%	1·6
7%	2·8
10%	3·8

Experimental Observations upon Intranasal "Carbogen" Administration.

The problem was to give "Carbogen" by the intranasal route and to measure the effect upon pulmonary ventilation. In all clinical methods of administration a continuous flow system is employed so that during expiration the "Carbogen" being given is merely blown out. This would prevent the measuring of the volume of expired air, so a "demand" system was designed. A "demand" system provides gas during inspiration only and ceases as soon as expiration starts. Such a

system would be very advantageous in clinical use. With the continuous system rates of flow greater than eight litres per minute always caused discomfort and few if any patients would tolerate flows greater than this. With the "demand" system rates up to twelve litres per minute are easily borne. During expiration the patient can swallow and cough without discomfort. With continuous flow methods swallowing cannot be achieved without the taking in of quantities of gas which can easily lead to distension and flatulence. A consistent observation of clinical importance was the discomfort and pain produced by unheated gas. None of the clinical methods provide for heating of the gas, but it was quite obvious that cold gas, even properly humidified, was a source of considerable discomfort. The experimental procedure carried out was as follows. The subject reclined on a couch and "Carbogen" was administered by a catheter passed into the nose so that the tip was just visible at the posterior edge of the soft palate. The gas was adequately heated and humidified so that there was no discomfort associated with its administration. The subject inspired through the nose and expired through a valved, tightly fitted rubber mouthpiece and the volume of expired air was collected and measured. During expiration the subject occluded his nostrils with the fingers of one hand so that no gas was expired through the nose. In this way all the expired air was collected. In the other hand the subject held a wide-bore tube, the opening of which was easily occluded with the thumb. This tube was connected with a T-piece to the lead from the gas cylinder (Figure IV). During expiration the subject released

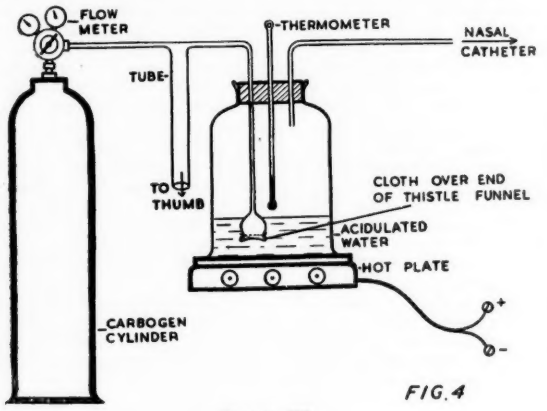

FIGURE IV.

his thumb from the opening of the wide-bore tube. The gas from the cylinder then passed entirely out of this tube, as shown by the absence of bubbles in the humidifier. During inspiration the thumb occluded the opening of the wide-bore tube. The gas then passed into the nasal catheter. In this way a "demand" system is provided so that gas enters the oro-pharynx during inspiration only.

The subject of the experiment was given five to ten minutes' trial with the method until his movements, by which he controlled the flow of gas, became automatic; none found difficulty with the method. The volume of expired air with the subject at rest, when compressed air was passed into the catheter, did not differ materially from the basal pulmonary ventilation found during the tent experiments. The percentage increases in pulmonary ventilation in this method, produced by 5%, 7% and 10% "Carbogen" concentration at eight litres per minute flow, are shown in Table V. The inadequacy of this method is obvious. It is due to the great dilution of the gas which occurs in this type of administration. Most patients, unlike the subjects of this experiment, breathe through the mouth as well as through the nose, so that the diluting effect must be even greater. The reason for the great dilution of the "Carbogen" becomes obvious in considering the following facts. The inspiratory phase lasts a little more than one-third of the total time taken to complete one respiration, even under carbon dioxide stimulation (Barcroft and Margaria, 1931). Consequently at a constant flow of eight litres per minute (a maximum under clinical conditions) only about three litres of the "Carbogen" being given has the opportunity to become part of the inspired air. At a basal ventilation rate of eight litres per minute this would dilute the "Carbogen" to about three-eighths (37%) of its stated concentration. Now, if we assume the desired effect to be 100% increase in pulmonary ventilation, the total inspired air per minute would become 16 litres, but the contribution by the catheter remains constant, namely, three litres. The dilution of the "Carbogen" then would be to about three-sixteenths of

TABLE V.

Increase in Pulmonary Ventilation with "Carbogen" by Catheter Method

Subject.	Gas.	Pulmonary Ventilation per Minute. (Litres.)	Percentage Increase.
P.P.	Air	7·3	—
	5% "Carbogen"	7·3	—
	7% "Carbogen"	9·0	23
	10% "Carbogen"	12·5	73
A.D.	Air	9·0	—
	5% "Carbogen"	12·0	33
	10% "Carbogen"	14·3	59
F.S.	Air	6·0	—
	7% "Carbogen"	6·6	12
	10% "Carbogen"	9·0	50
J.S.C.	Air	10·0	—
	5% "Carbogen"	11·0	10
	7% "Carbogen"	11·0	10
	10% "Carbogen"	12·0	20
E.G.	Air	6·6	—
	5% "Carbogen"	7·3	10
	7% "Carbogen"	8·3	25
	10% "Carbogen"	10·3	55

the stated concentration. It was pointed out in the previous section that to maintain 100% increase in pulmonary ventilation the concentration of carbon dioxide in the inspired air must be about 4%. Thus in the case just cited, with a basal pulmonary ventilation rate of eight litres per minute and with "Carbogen" being given at a continuous rate of eight litres per minute, it would be necessary to use "Carbogen" of about 20% concentration to produce the desired effect. (Three-sixteenths of 20% approximately equals 4%.)

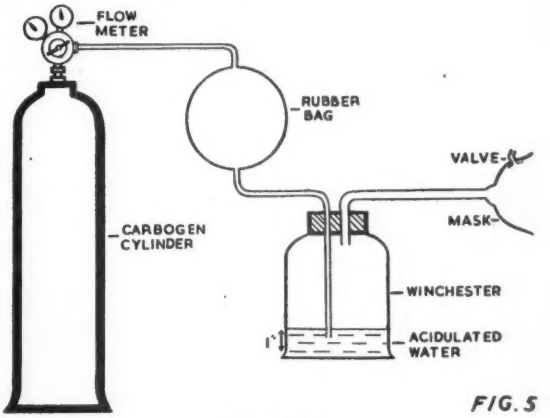

FIGURE V.

The practical conclusion is that "Carbogen" administration by the intranasal route should be abandoned. There is one occasion when it will produce an effect, namely, during the induction of ether anæsthesia owing to the increased sensitivity of the respiratory centre to carbon dioxide. With this exception the conventional concentrations of "Carbogen" have no therapeutic effect when given intranasally.

Administration of "Carbogen" by Mask.

Various types of facial masks have been recommended in the past for the administration of oxygen and "Carbogen". While very satisfactory for oxygen, they suffer from serious

disadvantages as far as "Carbogen" is concerned. If a known concentration of carbon dioxide is to be given, then it is necessary to exclude atmospheric air from the circuit. In the absence of a "demand" flow, that is, a flow confined to the inspiratory phase, the gas must be given at enormous rates. For example, if we use the same figures as in the case described in the previous section, to maintain a respiratory volume of 16 litres per minute a continuous flow of 48 litres per minute is necessary. Figure V shows a very simple "demand" system for giving "Carbogen" by mask, and we obtained adequate hyperventilation using 5% "Carbogen" at 20 litres per minute flow.

The mask is fitted with an expiratory valve only. On inspiration "Carbogen" is inhaled from the Winchester flask. The negative pressure allows "Carbogen" to flow from the rubber bag reservoir into the Winchester. During expiration most of the air passes out of the expiratory valve, but some of the dead space air returns to the Winchester until the water seal operates. During expiration the rubber bag reservoir gently fills up. A really deep respiration, such as frequently occurs during carbon dioxide induced breathing, and which uses about three litres of gas, is easily accommodated because the reservoir contains over two gallons of gas. Such a maximum deep breath usually occurs every minute or so during carbon dioxide induced deep breathing. A tight fitting mask with a continuous flow system which does not allow for this contingency causes "starving" of the patient, and is quickly followed by a request for the removal of the mask.

Summary.

1. Physiological considerations determining the use of carbon dioxide as a therapeutic agent are discussed.

2. Experiments are described designed to test the efficiency of two methods of carbon dioxide administration. Suggestions are made for improving these methods.

3. A method utilising a facial mask and providing for a "demand" flow is described. Its advantages are efficiency and economy.

Acknowledgements.

I wish to acknowledge the critical advice of Professor R. D. Wright, and the assistance of Dr. A. J. Christophers in the carrying out of some of the experiments.

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A CASE OF CAVERNOUS SINUS THROMBOSIS COMPLICATED BY MENINGITIS.

By BARTON VENNER,
Adelaide.

Clinical Record.

S.G., aged seventeen years, a waitress, was admitted to the Royal Adelaide Hospital under the care of Mr. Alan Britten-Jones on December 19, 1946. She gave a history that, eight days before, she had noticed a little pimple on the left side of her upper lip, and on succeeding days it became larger. She did not prick, squeeze or ill-treat it as she had been warned against this. Three days later she began to feel feverish and had a severe headache. In the last two or three days she had felt very ill and her whole face and lip had become puffy; two days before her admission to hospital her right eye became swollen and she could not see out of it. One day later she noticed that her neck was stiff and her head was aching. She denied any shivering attacks, sweating, cough or chest pain; she had not vomited although feeling nauseated. During examination she complained of tenderness over the outer aspect of the left thigh. A sulphonamide (about 10 grammes) had been given by a private medical practitioner before her admission to hospital.

On examination of the patient, her temperature was 102° F. and her pulse rate 136 per minute; the respirations numbered 30 per minute. The patient was a well-developed girl and appeared very ill. Deep cyanosis of the lips, ears and cheeks was present. The periorbital tissues of both eyes were œdematous, on the right more than on the left, and moderate chemosis was present. The right eye was almost closed; it could be moved slightly in all normal directions, but movement appeared to be considerably restricted by the œdema and there was a detectable proptosis of the globe. Both pupils were small, circular and equal, and reacted to light. Considerable swelling of the upper lip was present, more so on the left than on the right, due to the presence of a carbuncle, which appeared about to discharge at several points on the margin. Inside the mouth were several points of ulceration, both on the buccal mucosa and on the adjacent gingival mucosa. The lower lip was also œdematous and swelling extended backwards and downwards below the angles of the mandible and upwards to both eyes, giving the patient a bloated and bull-necked appearance. No cervical glands were palpable, although tenderness was elicited on both sides. The left horizontal ramus of the mandible was tender at about its mid-point. Considerable neck rigidity was present, but no retraction.

No abnormality was detected in the cardio-vascular or respiratory systems. The blood pressure was 116 millimetres of mercury (systolic) and 85 millimetres (diastolic). Examination of the abdomen revealed no abnormality. The tendon reflexes in both legs were normal; the plantar response was flexor in type. Over the outer aspect of the left thigh in its lower two-thirds deep tenderness was present, but no other signs of inflammation were found.

Examination of the ocular fundi revealed engorgement of the veins with pronounced swelling of the left disk; the right disk was possibly slightly œdematous. There was no hæmorrhage or exudate. The urine contained traces of albumin and ketone bodies.

Lumbar puncture was performed at once. The cerebrospinal fluid pressure was 280 millimetres (with the patient in the lateral recumbent position) and the fluid was opalescent; it contained 2000 leucocytes per cubic millimetre (90% polymorphonuclear cells). There were no bacteria in the direct smear and no growth was subsequently obtained on attempted culture. Fifty thousand units of penicillin in five millilitres of normal saline were given intrathecally at this time.

A diagnosis of cavernous sinus thrombosis with meningitis was made and the following treatment was instituted. The patient was encouraged to take fluids. Aspirin was given for the headache, with phenobarbital at night. Penicillin was given intramuscularly, 30,000 units every three hours; daily lumbar puncture and instillation of penicillin (50,000 units) was carried out. No local treatment was used, except for the use of warm alkaline mouth washes during the day and gentle cleansing of the lips when necessary.

The immediate response to treatment was dramatic. The patient became quieter and the temperature fell rapidly to 97° F. within twelve hours. On the morning of the second day her temperature was 99·4° F. and her pulse rate 104 per minute, and the respirations numbered 26 per minute. Her general appearance was much improved and she was taking fluids well. The pupils were now seen to be unequal, although reacting briskly; the left was a little larger than the right.

At this time, blood examination revealed a hæmoglobin value of 80% (Sahli), and the leucocytes numbered 33,700 per cubic millimetre, 89% being polymorphonuclear cells.

Lumbar puncture yielded a slightly cloudy fluid under pressure (180 millimetres). Penicillin was instilled. The fluid was not examined for cells.

On the third day a trace of bile was detected in the urine, and by the fourth day jaundice was apparent. The cyanosis had decreased and there was some diminution of the bloated facies; but the patient was still drowsy and apathetic and still complained of headache and stiffness of the neck.

On December 23 (fifth day), a small amount of thick pus escaped from a sinus in the upper lip. A culture was prepared and a growth of a coagulase-positive hæmolytic staphylococcus was obtained. On this day lumbar puncture yielded clear, colourless fluid under pressure (300 millimetres)—the first time clear fluid was obtained; it contained only 20 leucocytes per cubic millimetre, all lymphocytes. The leucocytes in the blood then numbered 32,400 per cubic millimetre, and the icteric index was 70. There was a reticulocytosis of 6%.

At this time the pupils were still unequal and a right abducens paralysis was first noticed; the patient admitted diplopia. Slight meningism persisted.

From this time, progressive improvement occurred. Resolution of the furuncle occurred without further suppuration, œdema of the face and later of the eyelids subsided, and headache disappeared. Irregular pyrexia (temperature below 100° F.) persisted for nearly three weeks in all. On December 25 (sixth day) the cerebrospinal fluid contained 310 leucocytes per cubic millimetre (28% polymorphonuclear cells, 72% leucocytes). The last intrathecal injection of penicillin was given on this day. On December 31, intramuscular penicillin injections were stopped, 3,500,000 units in all having been used. At this time jaundice was still present, but decreasing. The pupillary inequality persisted, as did the right external rectus palsy. Recession of the œdema revealed in addition a true ptosis of the right upper lid.

Progress was rapid, and on January 3, 1947, the leucocytes numbered 7700 per cubic millimetre of blood, the hæmoglobin value being 80%. The patient began to get up without any ill-effects. She was transferred to a convalescent hospital on January 13, after twenty-five days in hospital. At this time the neurological lesions persisted. They consisted of right external rectus palsy, right ptosis, and a small pupil on the right side, which now reacted rather less than the larger left pupil. The effect of instilling adrenaline solution (one in 1000) into the right conjunctival sac was tested; no dilatation occurred.

Comment.

This case illustrates well the dangers of apparently trivial infections of the upper part of the face, and in the pre-chemotherapeutic era this case would almost certainly have had a fatal outcome. Since the sulphonamide drugs and penicillin have become available, however, reports of successful treatment are not uncommon. Before 1936, Cavenagh (1936) found that of over 50 successful cases reported, probably not more than seven were of the acute infective type.

This case is notable in that generalized septicæmia undoubtedly occurred. The extensive hæmolysis is in accord with this, and it is probable that incipient metastatic osteomyelitis of the left femur was present, which was rapidly aborted by penicillin therapy. Although the acute fulminating nature of the process suggests a streptococcal ætiology, a pure culture of hæmolytic staphylococci was made from the labial infection, and this was probably the actual pathogen.

Oculomotor nerve involvement is not uncommon in cavernous sinus thrombosis, but the neurological signs in this case call for comment. The involvement of the right sixth cranial nerve is easily explained by its proximity to the cavernous sinus. There was some controversy about the pupils, it being debatable whether or not the left (larger) pupil was the defective one. However, it did not seem reasonable to suppose that only the intraocular division of the left third nerve should be affected. The signs of myosis and ptosis in the right eye were better explained as a sympathetic nerve paralysis on that side, possibly from involvement of the ciliary ganglion by œdema, or of the carotid plexus, as the internal carotid artery traverses the cavernous sinus. An attempt was made to confirm this by instilling adrenaline into the conjunctival sac. The sympathetic denervated iris is said to be more sensitive than normally to the dilator action of adrenaline (paradoxical pupillary reaction of Meltzer—Best and Taylor, 1939).

Although cases of recovery with sulphonamide treatment alone have been reported, penicillin seems to be the ideal therapeutic agent for such a grave condition as this. Both may be used, but the advantage is doubtful if the organism is penicillin-sensitive. The intrathecal injection of penicillin is not indicated in the absence of signs or symptoms of meningeal invasion; but when these occur they should be regarded as any other manifestations of purulent meningitis.

Acknowledgement.

Acknowledgement is made to Mr. A. Britten-Jones for permission to publish the report of this case.

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CONTINUOUS INTRAGASTRIC DRIP IN THE TREATMENT OF PEPTIC ULCER.

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(From the Clinical Research Unit of the Walter and Eliza Hall Institute of Medical Research and the Royal Melbourne Hospital.)

INTRAGASTRIC DRIP THERAPY for peptic ulcer was first devised by Winklestein in 1932. The solution he used for the continuous intragastric drip was milk and sodium bicarbonate or alumina gels. He has continued to use this method of treatment with very good results (Winklestein *et alii*, 1942).

Many observers such as Winklestein (1932) and Douthwaite (1947) have shown that the only satisfactory way to neutralize gastric hydrochloric acid continuously for days on end is by a continuous intragastric drip of milk. The theoretical basis for this form of therapy is that free hydrochloric acid is an important factor in preventing the healing of a peptic ulcer. This method of treatment for peptic ulcer has been used by many in Australia, but it is considered that it should be used more often than it is.

The method used in the Clinical Research Unit is simple and effective and will be described in detail.

Apparatus.

The apparatus required is not elaborate and includes the following: a milk mixture, Rehfuss tube, "Soluvac" bottles, dripper, screw clip, rubber tubing and glass connexions.

The Milk Mixture.

Miss C. N. Turner, dietitian to the Clinical Research Unit, was responsible for the preparation of the following milk mixture. The daily requirements of milk mixture are made up each morning and contain:

Milk	4½ pints
Skim milk powder	5 ounces
Sugar	10 ounces
Eggs	6
"Aktavite"	1 ounce

The milk powder is sprinkled on the milk and beaten with an egg whisk; beaten eggs, sugar and "Aktavite" are added and beaten until all is well dissolved. The

mixture is then strained, poured into "Soluvac" bottles, sealed and stored in the ward refrigerator. This mixture contains: protein, 170 grammes; carbohydrate, 500 grammes; and fat, 140 grammes; the total caloric value is 3900 Calories. The mineral content is: calcium, five grammes; phosphorus, three grammes; and iron, 10 milligrammes. The vitamin content is: vitamin *A*, 14,000 international units; thiamin, five milligrammes; riboflavin, eight milligrammes; nicotinic acid, four milligrammes; and ascorbic acid, 72 milligrammes. This is a suitable diet, except that it has a low iron, nicotinic acid and ascorbic acid content. The actual amount of this mixture can, of course, be varied to suit the needs of the individual patient.

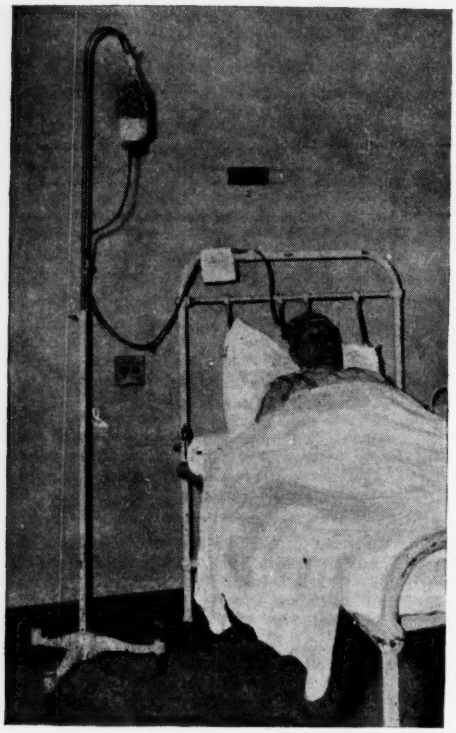

FIGURE I.

A patient receiving continuous intragastric drip therapy. Five pints of fluid containing 4000 Calories are given in twenty-four hours.

Technique.

The Rehfuss tube lubricated with mineral oil is passed via the nose into the stomach. Its passage down the œsophagus is facilitated by the patient swallowing sips of water. This Rehfuss tube is fixed to the face with adhesive strapping so that it passes over the bridge of the nose to the forehead. By means of a glass connexion and rubber tubing the Rehfuss tube is connected to a dripper which in turn is connected to the "Soluvac" bottle containing the milk mixture. The apparatus is arranged as shown in Figure I and the dripper is long enough to allow the patient to sit up in bed or on a chair.

Management.

The flow is regulated by means of a screw clip so as to maintain a continuous drip throughout the whole twenty-four hours of the day and a total volume of approximately five pints. An intelligent patient soon learns to regulate the flow himself. When one "Soluvac" bottle is empty it is not refilled with milk mixture, but replaced by a new full bottle which has been stored in the refrigerator. As a rule the tube is removed three or four times a week for the purpose of cleaning. During hot weather it is necessary to do this daily. The majority of patients are not worried by the intragastric drip for periods up to three weeks. The change over to a solid diet is a gradual one, so that during the second or third week, solid food of the ulcer type of diet is taken in addition to the drip feedings. At first one meal a day is given for a few days, working up to six meals a day, and at the same time the amount of drip feeding is gradually reduced.

Indications for the Use of Continuous Intragastric Drip Therapy.

Pain.

Pain which is not relieved by a routine ulcer régime, in particular a penetrating ulcer, is one indication for the use of this therapy. This is illustrated by the following case record.

CASE I.—A.S., a male, aged fifty-two years, was admitted to the Royal Melbourne Hospital on November 30, 1947. In 1935 he had been operated on for a perforated peptic ulcer and since then had been free from symptoms on an ulcer régime until four months before his admission. Over this period of four months he suffered from indigestion of an ulcer type—severe burning pain in the epigastrium three hours after meals—and he was frequently wakened by pain at 1 a.m. The pain was at first relieved by food, but over the last three weeks before his admission to hospital the pain was very severe, radiated through to the back, and required morphine to relieve it. There had been no vomiting.

The pain was not relieved by treatment with bed rest, sedatives, an ulcer diet, alkaline powders and belladonna. Continuous intragastric drip therapy gave relief of pain and after three weeks of this treatment he had gained fourteen pounds in weight and was completely free from symptoms. Barium meal examination at this stage revealed considerable deformity of the duodenal cap, but no other abnormality. Fractional test meal showed a high climbing curve of free acid.

Treatment with bed rest in hospital and an ulcer régime was continued for another three weeks, at the end of which time he felt extremely well.

In view of the severe pain radiating into the back it was thought that the ulcer was a penetrating one, but as the patient was anxious to try medical treatment he was discharged home. He remained free from symptoms for four weeks, when the symptoms recurred. After two weeks of severe pain he was readmitted to hospital on March 10, 1948. On admission he requested intragastric drip therapy. His pain was again relieved by this treatment.

As medical treatment had failed, partial gastrectomy was performed after three weeks on intragastric drip therapy. The duodenal ulcer was found to be penetrating deeply into the pancreas.

Continuous intragastric drip feeding was the only form of therapy which would relieve this patient's pain. It did not cure his penetrating ulcer, but did restore him to a state of health which enabled him to withstand the operation of partial gastrectomy.

Pyloric Stenosis.

Pyloric stenosis is a second indication. In these cases a liquid diet administered by continuous drip frequently passes through the narrowed pylorus, whereas solid food is vomited. In cases of pyloric stenosis with vomiting there is frequently salt deficiency and this can be corrected by the addition of salt to the milk mixture.

CASE II.—L.H., a male, aged fifty years, was admitted to the Royal Melbourne Hospital on June 19, 1948. He had suffered from ulcer dyspepsia for five years and was known to have a proven duodenal ulcer. During this period he had had two severe hæmatemeses. Four weeks before his admission he commenced to vomit. He would vomit approximately ten ounces of brownish fluid in the afternoon and again at night.

He had been treated in a country hospital with rectal injections of tap water and hypodermic injections of atropine, one-fiftieth of a grain three times a day. For at least one week he had taken practically nothing by mouth because of nausea, anorexia, vomiting and abdominal pain.

On admission to hospital he was thin and dehydrated. Continuous intragastric drip was commenced and continued for a period of three weeks. He received 4000 Calories each

day with this method of feeding. During this period he was free from pain and discomfort, there was no vomiting and he gained four pounds in weight. Barium meal examination revealed a chronic duodenal ulcer with delay in gastric emptying. Partial gastrectomy was performed four weeks after admission.

This patient, who was thin and dehydrated as a result of pyloric stenosis, was adequately prepared for operation by means of continuous intragastric drip therapy. Intravenous therapy is, of course, necessary in some cases of pyloric stenosis, but in many the more simple continuous intragastric drip therapy is adequate.

Summary.

1. Continuous intragastric drip therapy has been used for many years in the treatment of peptic ulcer, but it is considered that it should be used more often than it is.

2. The method of intragastric drip therapy is described in detail.

3. The milk mixture is a high-caloric one enabling the patient to receive 4000 Calories from five pints of fluid in twenty-four hours.

4. Feeding by this method is well tolerated by the patient for a period of three weeks.

5. Intragastric drip therapy is used when pain is not relieved by a routine ulcer régime and in the pre-operative treatment of pyloric stenosis.

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A RADIOLOGICAL INVESTIGATION OF WEIGHT-BEARING CHANGES IN THE HUMAN FOOT.[1]

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Introduction.

LAKE (1935) states that weight-bearing causes no significant change in the position of the bones of the feet. Wood Jones (1946), on the other hand, maintains that the foot arches are not static structures and that appreciable changes do occur. This paper describes a radiological investigation which supports Wood Jones and which also reveals an interesting difference between the right and left feet under weight-bearing.

Material and Methods.

One hundred and ten medical students were observed. Ten of these had abnormal feet (see below) and were excluded from the investigation. The remaining one hundred formed an otherwise unselected group. Their ages ranged from seventeen to thirty-six years, but the large majority were under twenty-five years of age. There were seventy-five males and twenty-five females in the group.

In Australia, the general nutrition and economic status of such a group is very good; but it is not greatly different from that of a similar age group drawn from the population in general. It is considered, therefore, that the results obtained in the investigation do not differ significantly from those that would be obtained from observation of a general group.

The class excluded from the one hundred and ten observed comprised three persons with *hallux valgus*, two with hammer toes, five with previous fracture in a foot or lower limb.

Vertical and lateral skiagrams of both feet were taken in the non-weight-bearing (sitting) and the weight-bearing (standing) positions. Levels of the films were carefully checked by spirit-level and set-square.

[1] This investigation was assisted by a grant from the National Health and Medical Research Council.

From these skiagrams the changes in the height and length of the medial longitudinal arch of the foot were measured (Figures IA and IB). These absolute measurements were then expressed as a percentage change in the original height or length of the arch. They are given, for each foot, as an average measurement for each group, male and female.

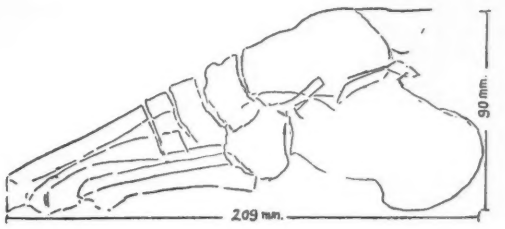

FIGURE IA.
Tracing from the skiagrams in a typical example: Non-weight-bearing.

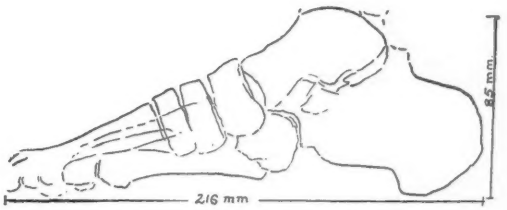

FIGURE IB.
Tracing from the skiagrams in a typical example: Weight-bearing.

Results.

The results are shown in the accompanying tables.

Statistical analysis of these figures gave the results shown in Table III.

Similar results are obtained if absolute measurements are used instead of percentages (see Table IV).

In the first half of the table the difference between right and left is as follows: Male, $P<0{\cdot}01$; female, $P<0{\cdot}05$; both are significant. There is no significant difference between male and female.

TABLE I.
Percentage Depression when Weight Bearing.

Measurement.	Male.		Female.	
	Right.	Left.	Right.	Left.
Mean	2·44	1·61	2·75	1·72
Median	2·33	1·22	1·80	2·00

TABLE II.
Percentage Lengthening when Weight Bearing.

Measurement.	Male.		Female.	
	Right.	Left.	Right.	Left.
Mean	2·16	1·39	2·13	1·38
Median	2·01	1·30	2·10	1·25

In the second half of the table the difference between right and left is as follows: Male, $P<0{\cdot}001$; female, $P<0{\cdot}05$; both are significant. There is no significant difference between male and female.

In view of the significant difference in depression and lengthening of the arch in both groups a table was drawn up to show the percentages of males and females giving: (*a*) Greater change in the right foot, (*b*) greater change in the left foot, (*c*) equal change in both feet (see Table V).

Incidental Observations.

In the course of the investigation the following observations were made on the one hundred normal individuals.

1. Metatarsal formula.
   - 2. 1. 3. 4. 5. .. occurred in 59 cases
   - 2.=1. 3. 4. 5. .. occurred in 3 cases
   - 1. 2. 3. 4. 5. .. occurred in 20 cases
   - 2. 3. 1. 4. 5. .. occurred in 18 cases
2. Extra ossicles.
   Os naviculare.
   - (*a*) Unilateral .. 3 cases
   - (*b*) Bilateral .. 3 cases

   Os trigonum.
   - (*a*) Unilateral .. 12 cases
   - (*b*) Bilateral .. 4 cases

   Bipartite seasmoid under head of first metatarsal.
   - (*a*) Unilateral .. 23 cases
   - (*b*) Bilateral .. 22 cases.

   Sesamoid bone near head of fifth metatarsal.
   - (*a*) Unilateral .. 6 cases
   - (*b*) Bilateral .. 1 case

   Sesamoid bone near head of second metatarsal.
   - (*a*) Unilateral .. 2 cases
   - (*b*) Bilateral .. 0 case.
3. In 32 cases the skin cleft between the second and third toes was anterior to the clefts between the first and second and the third and fourth toes. In none of these could any associated bony change be detected by X rays.

TABLE III.

Factor.	Between.	Result.
Depression.	Male and female (right foot) Male and female (left foot). Right and left feet (male). Right and left feet (female).	No significant difference. Right foot significantly greater than left.
Lengthening.	Male and female (right foot) Male and female (left foot) Right and left feet (male) Right and left feet (female)	No significant difference. Right foot significantly greater than the left.

TABLE IV.

Observation.	Measurement.	Male.		Female.	
		Right.	Left.	Right.	Left.
Depression (in centimetres).	Mean	0·2119	0·1428	0·2292	0·1391
	Median	0·2099	0·1227	0·1845	0·1620
Lengthening (in centimetres).	Mean	0·4192	0·2684	0·3978	0·2396
	Median	0·3937	0·2245	0·4120	0·1674

Discussion.

These observations show that under the weight of the body the medial longitudinal arch of the foot undergoes an average depression of about two millimetres and an average increase in length of about four millimetres. Also, the interesting fact emerges that one of the feet, usually the right, betrays a significantly greater change than the other. The extent of such difference, when it occurs, is the same in both sexes, but the incidence of the difference is higher in the male than in the female. Mainland (1945) states that the left lower limb is longer than the right in over 50% of individuals. This could account for the difference discovered here if it is assumed that some compensatory tilting of the pelvis to the right throws greater weight upon the right limb; but if the pelvis is maintained level the greater arch depression should occur more frequently on the left side; and *mutatis mutandis* where the right limb is longer. No record of the "handedness" of the students was kept, but Table V does not suggest any correlation between "handedness" and the differences found in the feet. The lower incidence of this difference in the female may reflect the lesser differentiation of the female inferior extremities as compared with those of the male (see Abbie, 1946).

Acknowledgements.

I wish to express my thanks to Professor A. A. Abbie, of the Department of Anatomy, University of Adelaide, for suggesting the subject and for advice during the investigation.

I am especially indebted to Watson Victor Limited for the loan of an X-ray machine and to Mr. R. Birtwhistle, Research Officer, Section of Mathematical Statistics, Commonwealth Scientific and Industrial Research Organization, for undertaking the statistical analysis of the figures obtained.

TABLE V.

Group.	Percentage Showing Greater Change in Right Foot.	Percentage Showing Greater Change in Left Foot.	Percentage Showing Equal Change in Both Feet.
Male	58·7	21·3	20·0
Female	40·0	24·0	36·0

Summary.

1. A radiological investigation was made on weight-bearing changes in the medial longitudinal arch of the foot in 100 students.
2. Significant changes in height and length were found in both feet in both sexes.
3. In nearly 60% of the males and in 40% of the females the change was significantly greater in the right foot.
4. There was no significant sexual difference in the magnitude of these changes.
5. Some of the implications of these findings are discussed.
6. Some incidental observations are recorded.

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THE REMINISCENCES OF AN ARMY SURGEON.

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HAD Dr. Walter Henry been a less fanatical disciple of the late Izaak Walton, his memoirs (1843) might have been compressed from two volumes to one and the reader would have been spared long descriptions of salmon fishing on the River Eske during his boyhood; of shark fishing from a troop transport bound for India; of catching flying fish at Saint Helena; and of salmon fishing (once again) in Canada. But apart from these anecdotes of rod and line, the memoirs are well worth reading, for in his twenty-eight years as an army surgeon the author had a varied and interesting career, in which he came into contact with a number of historic personages and took part in many historic events. At the same time the memoirs give an entertaining and instructive picture of the medical and surgical practice of the early nineteenth century. Below I have set out some of the highlights of his career as revealed in his memoirs, at the same time supplementing his observations and comments with a number of details gleaned from other sources.

Early Years.

Walter Henry was born and brought up in the north of Ireland where he received a "respectable country education". Later he commenced his medical studies at Trinity College, Dublin, but before they were completed

he proceeded to London, where, after a year's residence, he became qualified "to cut up His Majesty's lieges". At that time the Peninsular War was in progress, and inflamed with patriotic fervour, he decided to join the Medical Department of the army. There was no difficulty in putting this decision into effect, for, owing to heavy casualties from battle and from sickness, there was an acute shortage of army surgeons. So in due course he was gazetted "Hospital Mate for general service in His Majesty's Forces". This rather unflattering title of "hospital mate" was a relic of the days of the barber-surgeons, and shortly after his enlistment it was changed to "hospital assistant", and later still to "assistant staff surgeon".

The Peninsular Campaign.

About a week after his appointment Walter Henry embarked for Lisbon, where he began his long association with the 66th Regiment. This regiment experienced its full share of action during the campaign, and the memoirs describe many scenes of carnage with all their gory details. There are comments, too, on the diseases met with and the treatment given to battle casualties. Some of his observations are rather amazing. For example, on one occasion he had to take a convoy of 120 sick several days' journey over rough roads. Some of the patients were so weak that they had to be strapped to their mules, but, contrary to what one would expect, he said that all were benefited most strikingly by the journey. He even went so far as to say that several lives were saved by the trip.

Fairly early in his career he fell victim to an "intermittent fever", which was treated by a friend by the application of leeches to the head. In spite of his pleas, his friend refused to carry out venesection. For a long time afterwards he was subject to attacks of "tertian ague", but claimed that he cured himself, eventually, in a somewhat novel manner. Having dosed himself for a fortnight without effect, he decided to experiment, so just before the next rigor was due, he dosed himself with a tumbler of hot spiced wine, mounted his horse and galloped for some considerable time. The rigor did not develop, so he repeated the procedure every second day when the rigor was due. He claimed that he left the ague so far behind on these gallops that it never caught up with him again.

One unfortunate occurrence during the campaign was the unhappy fate which befell a number of soldiers of the brigade who drank water infested with leeches, so that 150 of them required treatment at the various regimental hospitals. The creatures had attached themselves to various places, including the mucosa of the mouth, nostrils, throat and gullet, while some even reached the stomach. Several ingenious methods had to be devised to dislodge them. Some were noosed with a silk ligature and torn off with the head still sticking to the mucosa; others were dislodged by strong saline, and others again by tobacco. Powerful emetics had to be used to dislodge those that had reached the stomach.

Dr. Henry described a few flirtatious interludes in billets, but if he is to be believed, these were much more innocent than those indulged in by the modern soldier. Apart from these, the only other noteworthy feature of his sojourn on the Iberian Peninsula was the strenuous stretch of duty he had in treating casualties during the battle of Barrioplano, when he had a continuous stream of wounded for five days and nights, and for two of these days he had no assistant.

It is appropriate to remark at this juncture that, to judge by the vast quantities of blood that surgeons of those days removed therapeutically, the blood volume of the Englishman of the early nineteenth century must have been much greater than that of his descendants of a century later. For example, the author cited the case of his friend Major Goldie, who received a ball in the lungs and was treated by enormous bleedings, to the extent of 300 ounces in two days. The worthy major lived to become a regimental commander.

After the surrender of Pamplona on October 31, 1813, the British army invaded France (Roberts, 1895). Here the bad condition of the wounds of the French prisoners excited Dr. Henry's comment, for as a result of bad French surgery the wounds were foul and sloughing and most of the stumps required reamputation. Among the British wounded was a corporal of dragoons who had engaged three French dragoons single-handed. He had killed one, put the second to flight, and wounded and captured the third, who had accompanied him in the ambulance cart, where, by the time Dr. Henry saw them, the two erstwhile foes had reached terms of greatest amicability. The corporal himself had 15 wounds on the head, face, arms and body. His nose was cut off and one bone of the forearm was cut through.

Fighting in France continued for several months, but on April 10, 1814, the defeat of Soult at Toulouse brought the Peninsular War to a close. Shortly afterwards the British army split up, the cavalry embarking at Boulogne and the infantry, including the 66th Regiment, at Bordeaux. There Dr. Henry took part in the wild celebrations indulged in both by the victorious British and by the inhabitants of Bordeaux, the former celebrating their victory and the latter the restoration of the Bourbons. From there the regiment returned to England for a short period prior to its next overseas assignment.

India.

The regiment's next tour of duty was in India, where Dr. Henry made several observations on the outlandish and unpleasant customs of the natives. Among the sights which shocked him most was the spectacle of decomposing corpses floating down the Ganges with vultures feeding on them. He considered that firm steps should be taken by the government to prohibit the throwing of corpses into the river, as, apart from æsthetic considerations, he attributed the prevalence of cholera and other pestilential diseases to this practice. Another Indian custom that horrified him was that of "suttee". Dr. Henry witnessed one of these ceremonies when, despite the endeavours of the Britishers present to dissuade her, the young widow insisted on mounting her husband's funeral pyre and accompanying him into the Hereafter.

While stationed in India the regiment was attacked by an epidemic of malaria. The medical authorities attributed it to camping, against their advice, in a low, marshy neighbourhood from which the Ganges had receded. This had exposed to the sun large tracts of mud "covered with animal and vegetable putrescence and exhaling almost invisible disease". It can be seen from this that the army medical authorities held the old "miasmatic" theory of the transmission of malaria. Many years were to pass before Laveran was to demonstrate the protozoal nature of the disease or before Ross was to prove its transmission by mosquito vectors. Regarding the treatment, Dr. Henry remarked that in Bengal there seemed to be a prejudice against bleeding; but as there was at first a mortality rate of 25%, they resorted to the usual practice of venesection, with a drop in mortality to 5% or 6%.

Saint Helena.

During the period for which the regiment was stationed in India, events were taking place in Europe which were to change the whole course of modern history. Napoleon had escaped from Elba, and with a mere handful of soldiers, proceeded on his triumphal way to Paris. The magic of his name and presence brought thousands flocking to him. Battle-hardened veterans of his earlier campaigns rallied once again to their beloved leader, while even the soldiers sent to oppose him greeted him with cries of *"Vive l'Empereur!"*. But this was not the Napoleon of Austerlitz, Jena or Rivoli. As Lord Wolseley (1895) states: "He was no longer the thin, sleek, active little man he had been at Rivoli. His now bloated face, large stomach and fat rounded legs bespoke a man unfitted for hard work on horseback." His strategic conceptions were still brilliant, but those physical qualities required to put them into execution—those qualities which had made him great—were lacking. Precious hours were wasted at Waterloo, and even during the action he sat for hours motionless at a table, often asleep. The story of his defeat and exile is well known, and the 66th Regiment

was among those who formed the garrison at Saint Helena, having been recalled from India for the purpose.

On September 1, 1817, Dr. Henry, with other officers of the 66th Regiment, was granted an interview with Napoleon. In some respects it was disappointing. To quote Dr. Henry:

> Napoleon's first appearance was far from imposing, the stature was short and thick, his head sunk into the shoulders, his face fat with large folds under the chin; the limbs appeared to be stout and well proportioned; complexion olive, expression sinister, forbidding and rather scowling. The features instantly reminded us of the prints of him which we had seen. On the whole, his general look was more that of an obese Spanish or Portuguese friar, than the hero of modern times.

During the interview Napoleon walked round the room and questioned most of the officers present about their service. The interview did much to dispel the glamour which, up till then, had surrounded the name of Napoleon.

As Napoleon's health during his captivity has occasioned much controversy, Dr. Henry's comments are worth recording. It would seem that much of the controversy arose from the fact that most of the people concerned with reporting his last illness and death had some sort of axe to grind.

When Dr. Henry first went to Saint Helena, Napoleon's personal physician was a Dr. O'Meara, who apparently had fallen under the spell of Napoleon and engaged in intrigues on his behalf. Being of gentlemanly bearing, he was made an honorary member of the regimental mess before this was known; but when it was discovered that he had been carrying mess gossip back to Napoleon his membership was terminated. He resigned his position and returned to England soon afterwards. It had been his contention that the climate of Longwood was unhealthy, that "gastro-hepatitis" was endemic there and that Napoleon suffered from it. Dr. Henry was among those who denied this.

After Dr. O'Meara's departure other physicians from the navy and army were appointed, but none relished the position. Attempts were made to bribe one of them (a Dr. Verling), who in consequence asked to be relieved of his post. Finally, a young Italian, Dr. Antommarchi, a pupil of Mascagni of Florence, arrived to take up the position. Signor Antommarchi's arrogance and self-confidence were matched only by his ignorance of therapeutics, so that he was heartily disliked both by the English physicians on the island and by Napoleon himself. In his last illness the Emperor suffered great agony from the emetics Antommarchi prescribed, so that he eventually refused all treatment.

In February, 1821, Napoleon's health began to fail. He complained of constant pain in the pit of the stomach with nausea and complete loss of appetite. From the first he seemed to be aware of the nature of his malady and referred to it as a disease of the stomach from which his father had died. Frequently he would clap his hand to the pit of his stomach and exclaim: "*Ah, mon pylore! mon pylore!*"

Concerning Napoleon's insight into the nature of his malady a modern biographer, Sokoloff (1938) has pointed out that all his life he had been haunted by the fear of carcinoma of the stomach, which had killed his father. So certain was he of the doom which awaited him that he believed himself to be immune from other dangers. To this belief, which was strengthened by several miraculous escapes in battle, may be attributed in part some of his reckless gallantry. Bullets would not touch him—he was doomed to die of cancer. This belief, too, had led him to take an almost morbid interest in anatomy, particularly the anatomy of the stomach, and during the height of his power he had received instruction in that subject from his personal physician, Corvisart, who would bring pieces of cadaver wrapped in a cloth for secret dissection in the Emperor's room.

On May 5, 1821, Napoleon succumbed, and an autopsy was performed by Dr. Antommarchi in the presence of Marshal Bertrand and General Montholon (two officers on Napoleon's staff), two officers on the Governor's staff and all the medical officers of the garrison. Dr. Shortt, the principal medical officer, instructed Dr. Henry to take full notes of the proceedings, and although the latter did not mention it himself, Sokoloff stated that he assisted Antommarchi with the autopsy. Although it was Dr. Henry who wrote the bulletin, he did not have the privilege of signing it, being only an assistant surgeon, for the Governor had ordered that only those of the rank of surgeon should sign. The findings, according to Dr. Henry, were as follows.

Contrary to the usual emaciating effects of the malady, the body was enormously fat. The fat had a feminine distribution and the genitalia were imperfectly developed. Over the sternum there was a coat of fat one and a half inches thick. The omentum, kidney and heart were loaded with fat and the last-mentioned organ was remarkably small and the muscle flabby. The stomach was extensively disorganized. In fact "it was ulcerated all over like a honeycomb". The chief focus of the disease seemed to be the pylorus, where Dr. Henry was able to put his finger into a hole that had eaten through the stomach; but communication with the peritoneal cavity was stopped by an adhesion to the adjacent liver, which was itself free from disease. The remaining organs were normal.

This description of Dr. Henry's is rather vague in some respects, and many relevant features are omitted. It is well, therefore, at this juncture to add a few details from other authorities, chiefly from Sokoloff. The latter quoted Antommarchi as stating that there was a slight adhesion to the left pleura, the superior lobe of the left lung was covered with tubercles and numerous small tubercular cavities were present. Other findings at the autopsy were an hypertrophied left kidney and small stones in the bladder associated with inflammation of the mucosa.

Some of the discrepancies in the various accounts may have been based on political rather than on scientific grounds. According to Dr. Henry, Antommarchi was about to sign the bulletin, but after consultation with the French officers declined to do so, and later issued an independent statement. Dr. Henry stated that the reason for this was that Napoleon's followers were anxious to obtain support for Dr. O'Meara's original diagnosis of "gastro-hepatitis", so that some blame could be placed on the Governor for the conditions under which he had kept Napoleon in captivity. Sokoloff mentioned, too, that there was a considerable amount of argument among the medical officers as to the state of the liver. Here again personal prejudices on the matter were probably the basis of their opinions rather than honest scientific judgement. But in spite of the conflicting accounts it seems fairly certain that the chief findings were a carcinoma of the lesser curvature, a tuberculous left lung, vesical calculi and cystitis. There was support, too, in Napoleon's general appearance for the presence of a pituitary dystrophy. This last finding was supported by the lethargy, the bradycardia and the susceptibility to cold present in the latter part of his life. During life, too, there had been periods when he had suffered from a pulmonary complaint, probably tuberculosis, and he had frequently been troubled with dysuria. It is worth noting, too, that his father Charles Bonaparte and his sister Caroline both died of carcinoma of the stomach, proved by autopsy, while his sisters Elissa and Pauline and his brother Lucien had died of what was thought to be carcinoma, although no autopsies were performed on them.

Naturally this predisposition of the Bonaparte family has excited the attention of students of gastric neoplasms. Thus Willis (1948), in discussing the question of inherited predisposition to gastric carcinoma, cites the case of the Bonaparte family, but states that, while there is an occasional instance like this where a family has a higher incidence of cancer than can be attributed to chance, in general hereditary predisposition is not an important factor in causation.

Canada.

With the death of Napoleon the garrison was no longer required on Saint Helena and the regiment embarked for home. Its next overseas posting was to Canada, and in

1827 it embarked for Quebec. During its period of service there the colony was subject to continual political unrest, which at times reached the point of armed rebellion. During this period, too, it may be remembered that a pandemic of cholera spread from India through Afghanistan and Persia to South Russia and thence to the rest of Europe (Rogers and Megaw, 1943). In June, 1832, it crossed the Atlantic and appeared in Quebec. The Director-General of the Army Medical Department at that time was the famous Sir James McGrigor, to whom, by the way, Dr. Henry's memoirs were dedicated. Sir James had issued detailed orders as to the steps to be taken in the event of an outbreak of cholera, and when a case occurred in Kingston, where the regiment was stationed, these measures were carried out promptly and energetically. The barracks were isolated and married soldiers and their families living in the town were moved across the bay. In consequence, it was some time before any cases occurred in the regiment. When the cases did occur Dr. Henry treated them by copious bleeding, and in the earlier cases the agonizing cramps disappeared and the patients recovered. He thought he had found the answer to the cholera problem, but was undeceived when many later patients were treated the same way but died. As a result of this experience he considered that there were two different types of the disease. The first was marked by severe spasms and yielded to copious bleeding, while the second stole on more quietly but had a much worse prognosis. Perhaps the first group stood the treatment better.

The doctors in Kingston had heard wonderful accounts of the results of intravenous infusion of saline, so it was tried in twenty hopeless cases. In every case the initial effect was good, and in some almost miraculous; but the improvement was not maintained and all the patients died. This method of treatment appears to have been tried first by Latta and McIntosh in Edinburgh in 1831 (Scott, 1942). The former had tried the rectal administration of saline before deciding to give it intravenously. The treatment seems to have enjoyed a vogue and Sir James Paget (Stephen Paget, 1910) mentioned seeing it tried in the days of his apprenticeship. The experience of the Kingston doctors tallied with that of Latta and McIntosh and all others who tried it. The initial effect was usually good, but the final outcome disappointing. This may be attributed to inadequate therapy in some cases, but in the main it was probably due to infection introduced with the saline. In spite of their failure, those who pioneered this method of therapy were close to the answer to the problem; but it was not till early in the present century that Rogers (Rogers and Megaw, 1943) was able to put the saline therapy of cholera on a satisfactory basis.

In 1834 another cholera epidemic struck Kingston. This was marked more by symptoms of debility and prostration and less by violent spasms than was the earlier outbreak. The mortality, too, was considerably higher. There was some difference in the treatments in vogue in the two epidemics. Laudanum, brandy and stimulants were used more sparingly in the second, and as tetanic spasms were not a feature of this epidemic, venesection was not used to the same extent. Calomel was not used so much, but lead acetate was tried and thought to be of some benefit. Dr. Henry's favourite treatment was castor oil with a small quantity of laudanum. During the second epidemic he contracted the disease himself, and in the early stages this was the treatment he used. In 1839 the regiment returned to England, but Dr. Henry did not accompany it. He had been promoted in the Medical Department of the army and was remaining in Canada, so the time had come to bid his old comrades farewell. The memoirs come to an end at this point.

Acknowledgements.

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POST-OPERATIVE MANAGEMENT AND COMPLICATIONS OF RETROPUBIC PROSTATECTOMY.

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THIS article is based on twelve months' personal experience of the post-operative management in over 120 cases of retropubic prostatectomy performed at All Saints' Hospital, where this technique has been mainly evolved.

Both Dominion and foreign visitors to the hospital have been keenly interested in the post-operative management of these patients, and it is felt that a detailed account of this would be of value.

After any surgical procedure post-operative care plays a vital part in its success, and in no procedure is this more true than in any form of prostatectomy.

An experienced nursing staff is of great value in the care of patients following retropubic prostatectomy—as it is in all operations—but this experience is no harder to gain, or more difficult to apply, than the experience of nursing other types of prostatectomy.

Prostatic surgery deals with patients in the older age groups, frequently with poor renal and cardiac functions, and meticulous attention to what may appear as details in their post-operative care is essential in order to conserve their already depleted reserves.

Catheter and Drainage.

At operation a thin-walled soft rubber 18F to 22F Harris catheter is inserted into the bladder before the prostatic capsule is closed with a continuous stitch. The surgeon or his assistant checks by palpation that the eye of the catheter is in the optimum position just inside the bladder neck and that the tip has not doubled back.

The alternative method of a Foley catheter with the hæmostatic bag in the prostatic cavity, with or without "Oxycel" gauze wrapped around it, is not favoured for the following reasons:

1. The more rapidly the prostatic cavity contracts down, the more rapid will be the cessation of hæmorrhage, and the quicker the urethral convalescence. This is prevented by the bag.

2. The distended bag is not only a doubtful hæmostatic agent, but it may exert enough pressure to cause leakage at the suture line in the prostatic capsule, or even rupture of the suture, in which case severe hæmorrhage may follow.

3. The large Foley catheters advocated by some American authors—24F—have actually a smaller lumen than the 18F Harris catheters, owing to their thick walls and double lumen. Hence no advantage in drainage is obtained, and they have the disadvantage of an increased risk of stricture formation.

4. "Oxycel" gauze is not used because the whole prostatic cavity is easily seen and any obvious bleeding points are coagulated. Bleeding, if present, is mainly from the cut capsule and is controlled by the continuous suture

which closes the capsule. Thus "Oxycel" gauze in the cavity is not necessary, and leads only to blockage of the catheter when it disintegrates. If a Foley catheter must be used, the bag should be within the bladder, performing a retaining and not a hæmostatic function.

The patient is given a small bladder wash-out before leaving the operating table, three or four ounces of saline are left in the bladder, the catheter is spigoted, and the patient is carefully returned to bed. Once the patient is in bed the catheter is connected to a drainage bottle into which it drains continuously. The foot of the bed is not elevated unless this is absolutely necessary, as it only impedes bladder drainage and facilitates clot formation.

Bladder irrigations at regular intervals after operation are not routine, being resorted to only if drainage is not free, and then as infrequently as possible and under the most rigid aseptic conditions. It must be remembered that drainage in any case is not great in the first twenty-four hours, and during that time an average patient receives between two and four gentle wash-outs. If an irrigation is required, it is given with a metal syringe of the Thomson-Walker type, and during the irrigation the patient is kept warm with covering blankets and is not allowed to lie stripped and chilled on the bed.

Urinary drainage is heavily blood stained for the first twenty-four hours, but gradually lightens until by the third or fourth day it is clear. The catheter is retained while the drainage is blood stained, usually being removed on the third day.

After removal of the catheter, most patients experience no difficulty in passing urine, but if, as occasionally happens, they do, the catheter is reinserted for a further period of forty-eight hours and then removed again.

At operation a small corrugated rubber drain is placed in the retropubic space and led out through a small stab wound below the main incision. This drain is removed within forty-eight to seventy-two hours.

Drugs.

Culture is made of a mid-stream specimen of urine as a routine measure after operation and, depending on the organism, the appropriate chemotherapy is instituted. As a rule sulphadiazine administration, one gramme every six hours, is commenced twenty-four hours before operation (or earlier if an indwelling catheter is in place) and continued for four or five days after operation or as long as is indicated.

Penicillin, 200,000 units every six hours, is used post-operatively when indicated, but not as a routine measure.

Fluids.

Fluid intake by mouth is encouraged and insisted upon at the earliest opportunity after operation, the minimum intake being five pints per day.

In those cases in which there is poor renal function, we feel that an intravenous drip infusion of sodium sulphate solution 4·285% is of great value. This is started during the operation and continued slowly until one or two litres have been given, and is invaluable in maintaining urinary output, particularly in the first few hours after operation when fluids by mouth are difficult to give.

Hæmorrhage during the operation is never sufficient in itself to warrant a blood transfusion. However, if the hæmoglobin value of these old prostatic patients is regularly estimated, it will frequently be found to be low and a blood transfusion before or after operation may be indicated.

At All Saints' Hospital post-operative blood transfusions have been given in 5% of cases, and nearly all these for secondary hæmorrhages some days after operation.

Pain.

Pain, in contrast to that associated with the transvesical methods of prostatectomy with their excruciating bladder spasms, is conspicuous by its absence, one post-operative injection of morphine one-quarter grain usually being sufficient. If the patient complains of discomfort or a desire to micturate, blockage of the catheter is immediately suspected, and steps should be taken to clear the blockage and reestablish drainage. This fact cannot be too strongly impressed upon the nursing staff, because the post-operative comfort of these patients is one of the striking features of the operation, and it is most uncommon for them to complain of pain.

Exercises, early rising, deep breathing and coughing are all encouraged, the patients getting up on the second or third day after operation, and the average patient is discharged to home on the twelfth day. Many are fit to go before this, but it is felt wise to keep them in hospital until the main danger of secondary hæmorrhage is past.

Complications.

The easy convalescence of these patients, due mainly to the complete and non-traumatic enucleation of the adenoma, efficient hæmostasis under vision, and absence of suprapubic drainage, is interrupted by few complications.

Reactionary Hæmorrhage.

Reactionary hæmorrhage is less frequent than after other forms of prostatectomy, because adequate visualization of the prostatic bed is obtained and any obvious bleeding points are coagulated. Coagulation is applied only to spurting prostatic arteries and is required in about 25% of cases. Bleeding from the cut capsule is controlled by the continuous hæmostatic suture of closure.

This suture line should be firmly closed and the retropubic space be quite dry at the conclusion of the operation. If there is troublesome oozing from a vein, which is not controlled by an interrupted suture, there is no objection to leaving a small gauze pack on the area for twenty-four hours.

Secondary Hæmorrhage.

Secondary hæmorrhage is liable to occur after any form of prostatectomy when infected urine is bathing a raw area. It is less frequent, however, if hæmostasis is obtained under vision at the time of operation, rather than by reliance on foreign materials, such as gauze or rubber bags, to effect this.

It will occur occasionally in spite of sulphonamides and penicillin, usually about the sixth or seventh day, less commonly up to the twelfth day, but rarely later.

Reappearance of a little blood in the urine is a warning sign, requiring careful watching and the reinsertion of a catheter at the least suggestion of any but minor quantities of blood. This should be maintained for forty-eight hours, or until the urine clears again.

Secondary hæmorrhage requiring the reinsertion of a catheter occurred in 10% of a large series of cases at All Saints' Hospital. In only 4% of cases was a blood transfusion required.

If a severe secondary hæmorrhage does occur, the patient rapidly becomes shocked and morphine to relieve pain should be given, clots should be evacuated from the bladder by washouts, and blood transfusion should be started. If difficulty is encountered in the evacuation of clots, suction applied through a large gum elastic catheter with a piston syringe will solve the problem.

Glycerin and pepsin, one ounce, injected into the bladder and left for one hour, may liquefy small amounts of clot causing urinary retention, but will be of no avail for large secondary hæmorrhages with extensive clot formation.

If treated promptly and energetically, post-operative hæmorrhage, either reactionary or secondary, can practically always be dealt with by the transurethral route. Millin, in over 750 cases of retropubic prostatectomy, has had to perform a cystotomy on only one occasion for hæmorrhage.

Suprapubic Urinary Leakage.

Despite early removal of the urethral catheter, suprapubic leakage of urine is uncommon, but if it does occur, reinsertion of the catheter for three to four days rapidly dries it up.

This complication is more likely to occur if hæmostasis is imperfect, a hæmatoma being allowed to form in the

retropubic space. The ultimate discharge of this hæmatoma through the stab wound may be followed by some leakage of urine.

Persistent suprapubic fistula, that bugbear of the transvesical methods, definitely does not occur after retropubic prostatectomy. This is because it is an extravesical technique, and because the prostatic bed can be clearly seen and small adenomata at the apex of the gland can be removed under vision. In the transvesical methods of prostatectomy these adenomata are more liable to be missed, as they are not seen. They lead to persistence of the suprapubic fistula, and endoscopic resection is required for their removal and for closure of the fistula.

Incontinence of Urine.

Incontinence of urine is less likely to occur after retropubic prostatectomy because the urethra is cut across with scissors at the apex of the gland before the enucleation is performed. This avoids the danger of avulsion of the mucosa of the membranous urethra.

There may be transient incontinence following removal of the catheter, noticeable mainly at night; this clears up within a few days.

There has been no case of persistent incontinence in our series, but we have seen three cases in which this complication occurred and persisted after retropubic prostatectomy elsewhere.

Late Post-operative Bladder-neck Obstruction.

Millin reported five cases of late post-operative bladder-neck obstruction following his first 75 retropubic prostatectomies, but since excising a wedge from the posterior lip of the bladder neck in practically all cases, he has experienced this complication only three times in the last 700 cases. These three have been minimal and responded easily to dilatation.

This wedge excision is an essential and important step in the operation, particularly in those cases in which sclerotic bladder necks were present. If a large subcervical or posterior commissural lobe has been removed and a patulous bladder neck left, this may be pinned down with a Harris stitch, without removal of the wedge. The ureters are in no danger during this step, as the ureteric orifices and interureteric bar can be plainly seen.

Infection.

Control of urinary infection is greatly aided by sulphonamides, penicillin and streptomycin, and four weeks after discharge from hospital, the urine of these patients is clear or only faintly hazy. The urine certainly clears more rapidly than after endoscopic resection or transvesical prostatectomy.

Occasionally, as with any form of prostatectomy, acute pyelonephritis ensues, and this, becoming chronic, fails to respond to any chemotherapy, leading to the death of the patient. Fortunately, this complication is uncommon, and its incidence can be reduced by intensive pre-operative measures to clear the urine.

Wound Infection.—For practical purposes wound infection is uncommon and rapid healing of the wound is aided by bringing the rubber drain from the retropubic space through a stab incision below the transverse wound. Pelvic cellulitis, due to opening up of the retropubic space, much feared of old, is in our experience largely fantasy.

Epididymitis.—Both vasa are ligated routinely at the conclusion of the operation and so epididymitis occurrence is very rare.

Osteitis Pubis.—*Osteitis pubis* condition has been reported a number of times, particularly in America, but its occurrence is not confined to cases in which the retropubic approach is used. Pricking of the periosteum with the boomerang needle is an easy, but not very satisfying, explanation when one observes that it occurs after operations on the bladder not exposing the pubis and even after endoscopic resection.

It is a rare complication, and we have met with it but once at All Saints' Hospital. It is characterized by pain over the pubis, pain in the adductor muscles and a disinclination to walk. X-ray examination reveals a widening of the pubic symphysis and a moth-eaten appearance of the edges of the pubic bones. There is no specific treatment, and it may take weeks to subside completely.

Œdema of the Penis.

Œdema of the penis is an uncommon and minor complication which subsides within a few days.

Other Complications.

Pulmonary embolus, pulmonary collapse and coronary thrombosis are likely to occur in patients of the prostatic age group, and are treated on standard lines.

Conclusions.

Our experience at All Saints' Hospital leads us to the inevitable conclusion that retropubic prostatectomy has many advantages of approach, visualization and hæmostasis.

It offers the old men concerned a remarkably rapid, comfortable and trouble-free convalescence.

These advantages, we believe, make it the operation of choice for benign hypertrophy of the prostate.

Acknowledgement.

I should like to acknowledge my profound indebtedness to Dr. Terence Millin for his encouragement, enthusiasm and criticism, which are a stimulus and an inspiration to all those who work with him.

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THE EARLY CLINICAL DIAGNOSIS OF CARCINOMA OF THE LUNG.[1]

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CARCINOMA of the bronchus accounts for over 90% of tumours found in the lung. It is one of the common forms of malignant disease and its incidence is coming to rival such conditions as carcinoma of the colon. Whether it is actually on the increase or whether it is diagnosed more frequently now is not known. The results of treatment of bronchial carcinoma today compare favourably with, or in some cases are better than, those of cancer of other organs. The importance of early diagnosis, therefore, becomes of more than academic or merely prognostic importance.

The following account is based on observations in over 150 cases. It in no way attempts to deal fully with the subject; but certain aspects relevant to the title of this article are stressed.

Preliminary Considerations.

If certain fundamental facts are considered, most of the symptoms and signs are easily explained. Any foreign body in a bronchus causes irritation and cough. Any break in continuity (or ulceration) of the bronchial mucous membrane causes bleeding and thus cough and hæmoptysis.

[1] This work was done during the tenure of a Gordon Craig Overseas Travelling Fellowship.

Partial obstruction of the bronchus may cause wheeze or stridor. Partial or complete obstruction may give rise to retained secretion and infection distal to the obstruction, causing suppuration or abscess. A carcinoma in the lung, as elsewhere in the body, may necrose and break down, and when its necrotic contents are discharged into a bronchus the mimicry of a lung abscess may be exact. Finally, the tumour may be close to the pleura, which it irritates or which it may breach, and it may extend beyond the pleura to invade the chest wall, with its bony, vascular and nervous components.

Carcinoma of the lung always arises from bronchial mucous membrane. It may occur in the main, lobar or segmental bronchi, or it may occur in the finer bronchial terminations in the periphery of the lung. The growth may affect the bronchus and act as a foreign body, as an ulcer, or as a partial or complete obstruction, or it may form a space-occupying lesion in the lung parenchyma.

Like carcinoma elsewhere, it varies in its malignancy and thus in its course. It spreads both by the lymphatics and by the blood-stream. Because of its situation in the course of the lesser circulation it may be disseminated widely by the systemic arteries.

The age incidence varies widely. Most patients examined are in the fifties or early sixties; a great many are in the forties, the thirties are by no means exempt, and one has seen two patients aged under thirty years. The incidence is greater among men, the incidence usually given for women being about 20%, although one's impression is that it is nearer 10%.

Clinical Types.

Most patients largely fall into one of three groups—those with focal symptoms, those with general symptoms, and those with lung infections. For the sake of completeness one might include a fourth group—those found by mass radiography; but when patients of this last group are examined they usually have some of the symptoms and signs about to be discussed.

Before the fundamental symptoms and signs are considered it should be noted in passing that the earliest manifestations in a certain group of cases are in reality late pathological complications. These are mediastinal obstruction, lymphatic spread to supraclavicular or axillary lymph nodes, blood-stream spread to liver, brain or bones, multiple deposits in the skin, or occasionally a deposit in some bizarre site such as the nail-fold or eye, owing to dissemination in the systemic circulation.

Focal Symptoms.

Cough is the commonest of all symptoms. It is often unproductive in the early stages, but bronchial irritation by the tumour soon causes some mucoid sputum. If bronchial obstruction occurs, stagnation and infection will supervene to perpetuate and increase the cough. Occasionally the cough may be due to the presence of enlarged tracheo-bronchial lymph nodes with involvement of the lower part of the trachea or main bronchus and the cough becomes "brassy" in character. The involvement of the recurrent laryngeal nerve also may alter the character of the cough by affecting the innervation of the vocal cord.

Hæmoptysis is one of the most suggestive and commonly found symptoms. It is rarely large in amount and most often comprises streaking or staining of the sputum, or the material consists of small clots. The blood-spitting is characteristically persistent, recurring every day or every few days for weeks or months. In its persistence it is unlike the alarming episodes which complicate bronchiectasis or tuberculosis. One has often been impressed by the phlegmatic way in which some patients with carcinoma view this symptom, compared with the alarm which this dramatic event usually arouses. The bleeding from bronchial carcinoma is usually characteristic, occurring in no other condition in quite the same way. Even adenoma of the bronchus, which is characterized by recurrent hæmoptysis, is usually more episodic in the way it produces hæmorrhage.

Wheeze or stridor is most important, both as a symptom and as a sign. It may be inspiratory, expiratory, or both, and cannot be cleared by coughing. It is a symptom which also has to be elicited sometimes by direct questioning. It may be localized by the patient to one side or even to one area of the chest, although not always so. An observant patient may even notice that it recurs at a given phase of respiration, when the partially obstructed bronchus lets air either in or out of the particular segment involved.

Sputum may be mucoid, muco-purulent or purulent. When infection or an abscess is a complication the sputum may become foul-smelling. Because the tumour tends to obstruct the bronchus infection tends to be pent up peripheral to this and the sputum usually does not reach the great quantities seen in lung abscess, although this is by no means invariable.

Dyspnœa on exertion is infrequent as a presenting symptom, although, on questioning, it is found to be present in most cases to a greater or lesser degree. It is sometimes out of proportion to the amount of lung apparently involved, a fashionable explanation at present being interference with the Hering-Breur reflex. Be that as it may, dyspnœa is often a prominent feature of the emphysematous chronic bronchitic type of patient who has a bronchial carcinoma, and it is a disturbing symptom when a patient is being considered for operation.

Pain of some sort or other is frequent. Apart from obvious cases in which pleural or chest wall involvement is present, many patients, if questioned, have some deep, dull, rather vague pain, aching in type or merely a discomfort in the chest. This pain often localizes the position of the tumour, although it may be retrosternal in position.

General Symptoms.

Pulmonary osteoarthropathy is a symptom complex which is most important, is not infrequent, and in some cases enables the diagnosis to be made. This takes the form of painful and swollen joints, several usually being involved. The peripheral joints, such as the fingers, wrists, knees and ankles, tend to be involved. Finger clubbing usually, but not invariably, accompanies these changes. The condition is sometimes severe and well nigh crippling. It may be entirely subjective, although there are usually objective signs, and even frank hydrarthrosis occurs. Œdema of the legs may be seen, which, although worse at the end of the day, is not entirely gravitational; one has seen it most noticeably over the anterior aspects of the shins. Radiological confirmation in the form of thickened periosteum along the shafts of bones adjacent to the affected joint may be obtained. It is a symptom which clears up immediately the affected lung is removed—in fact, its disappearance may be the first comment a patient makes on recovery from the anæsthetic after a successful operation. It is an astonishing condition, and one may say that a patient presenting with this condition, who has a segmented lung lesion or an opacity in the lung, is practically certain to have a bronchial carcinoma. There is but one exception to this, and that is a fibroma in the chest—an uncommon condition, which may be accompanied by similar joint pains.

Symptoms of Acute Lung Infection.

The occurrence of an acute lung infection is a common manner of presentation. In the case of a man aged over forty years who has some acute infection thought to be pneumonia, "pneumonitis" *et cetera*, and who does not respond in the expected way to treatment, one must always bear in mind the possibility of carcinoma. If lack of resolution persists, one must strongly suspect the condition; if such symptoms as hæmoptysis or blood staining of the sputum persist or if wheeze or stridor develops, bronchial carcinoma must be assumed until the diagnosis is proved otherwise. A relapse in the ensuing weeks or months following pneumonia should always throw doubt on the original diagnosis and call for further investigation.

A lung abscess in a patient aged over forty years is due to bronchial carcinoma in approximately one in three cases.

Important Physical Signs.

Very few physical signs are characteristic of bronchial carcinoma. However, there are two very important signs which should be stressed.

Stridor or wheeze heard when the patient is breathing through the open mouth is the most useful single physical sign in establishing a clinical diagnosis of bronchial carcinoma. It is often heard without the aid of a stethoscope and should always be sought. Stridor may be high-pitched and wheezy in quality, or it may be deep and sonorous, especially if the growth is involving the main bronchus or the lower part of the trachea. It can occur in bronchial occlusion and stenosis from other causes, but when it is present combined with some of the other features described above it is highly suggestive of bronchial carcinoma.

Absolute dulness to percussion, which is not due to the presence of fluid, is due to neoplasm.

The two signs described are the only ones which are really helpful in establishing a positive clinical diagnosis of bronchial carcinoma.

Finger clubbing should be mentioned, as it has been one's experience to see this commonly if one looks for it. Although it is well recognized in certain of the cyanotic heart lesions and in suppurative lung conditions, occasionally one sees gross clubbing with carcinoma of the lung, especially when complicated by infection.

Summary and Conclusions.

The symptoms which may decide one to investigate a patient fully are as follows: (*a*) cough which is chronic, progressive or even different from the patient's usual "smoker's cough", which has been present for years; (*b*) unexplained change in the cardio-respiratory health of a patient aged over forty years—dyspnœa for example; (*c*) hæmoptysis having the characteristics described above; (*d*) the failure of pneumonia to respond to treatment, or its recurrence in ensuing weeks or months.

The physical signs to be elicited are as follows: (*a*) the presence of stridor as described; (*b*) the finding of absolute dulness to percussion, which is not due to fluid; (*c*) finger clubbing in a man of the cancer age who has any loss of general well-being, and especially if accompanied by any of the above-mentioned symptoms or signs.

Even if an X-ray examination of the chest (or an X-ray report) apparently gives negative results, but some of the described symptoms and signs are present, bronchoscopy as the next step is obligatory.

Finally, if all symptoms, signs and radiographic and bronchoscopic evidence have been considered and suspicion still exists, the final court of appeal in a small number of cases may be exploratory thoracotomy, which is quick, easy, and safer than exploratory laparotomy.

At the present time it is largely the awareness of the early clinical manifestations of bronchial carcinoma which is increasing the number of patients found to be suitable for treatment.

The number of five-year survivals following operation is now sufficiently great to merit comparison with the results of surgery for cancer of other organs. In addition, palliative treatment can be offered to a great many patients for months or even years, with the relief of that distress of mind and body which is so often the lot of patients at the end of this disease. Unless specific contraindications exist every patient's case should be assessed critically before he is denied the benefits of treatment.

Acknowledgements.

It is with pleasure that I record the debt I owe to Mr. R. C. Brock, of the Brompton Hospital (where I served as resident surgical officer) and of Guy's Hospital, London, for his help and guidance. Also my thanks are due to Dr. H. M. Foreman, M.B.E., resident medical officer of the Brompton Hospital, for his helpful criticism, and to Miss J. M. Bayliss, his secretary, for help in the preparation of this article.

Reports of Cases.

TWO CASES OF MENINGITIS.

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Case I.

THE first case was one of influenzal meningitis successfully treated with streptomycin. The patient was a woman, aged thirty-nine years. Four days prior to her admission to hospital she suddenly fell ill with headache and vomiting. She was afebrile, but became progressively drowsier, and two days later complained of pain in the back of her neck and in her loins. Her speech was slurred and she maintained a constant repetition of a set few words. Next day (August 4, 1948) she was admitted to the Royal Melbourne Hospital in a semi-comatose state. It was ascertained that thirteen months previously she had been a patient in the Royal Melbourne Hospital with a fractured skull following a fall from a motor omnibus. Radiographic examination at that time revealed (*a*) a vertical fracture across the middle of the right petrous temporal bone and (*b*) a linear fracture of the occiput extending into the *foramen magnum* (see Figure I).

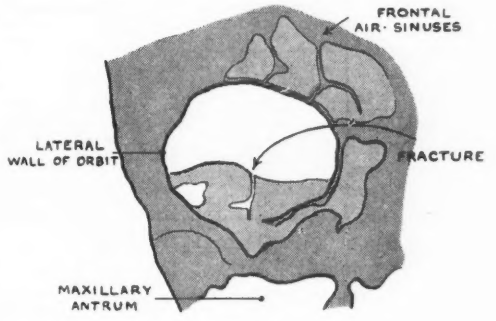

FIGURE I.

Case I: Drawing from an antero-posterior radiograph of the skull (July 25, 1947) showing vertical fracture of the right petrous temporal bone.

Examination of the patient revealed the following. She was flushed and distraught, her neck was hyperextended and infected herpes were present about her lips. Her temperature was 97·4° F., her pulse rate was 88 per minute and her respirations numbered 21 per minute; her blood pressure was 130 millimetres of mercury (systolic) and 80 millimetres (diastolic). Her pupils reacted equally. Testing of the urine with Fehling's solution resulted in an orange colour; Kernig's sign was elicited and she was photophobic, but no other neurological signs were present. Lumbar puncture revealed turbid fluid under low pressure.

A diagnosis of meningitis was made and treatment was commenced as follows. Penicillin was administered intramuscularly, 30,000 units *statim*, 15,000 units every three hours. Sulphadiazine was exhibited, three grammes *statim*, two grammes in two hours and one gramme every four hours.

Next day lumbar puncture produced no cerebro-spinal fluid, burr holes were made and penicillin solution (15,000 units in five millilitres) was instilled into each ventricle alternately over the next two days.

By this time culture of the cerebro-spinal fluid had produced a profuse growth of *Hæmophilus influenzæ*; this finding was confirmed by subsequent culture. On this account streptomycin therapy was commenced, 0·5 gramme being given intramuscularly three times a day and 50 milligrammes intraventricularly once a day.

Lumbar puncture was successful again on August 12, when the use of the intrathecal route for the administration of penicillin and streptomycin was resumed.

The progress of the patient is outlined in Figure II; the minor convulsive seizures on August 10 and 11 were not repeated. A further spinal block occurred on August 16 and necessitated ventricular aspiration for a period of four days.

After this incident, the patient's general condition improved without interruption until her discharge from hospital to convalesce seven and a half weeks from the time of her admission to hospital. By then she was well, but had lost weight and felt weak. She has since been examined in the out-patient clinic and has slowly consolidated her recovery.

Additional investigations performed during her stay in hospital were as follows.

1. An X-ray examination of her skull on August 12, 1948, showed that the fracture line in the right petrous temporal bone was still visible, but it was narrower than on July 25, 1947. On December 17, 1948, a further X-ray examination revealed a pronounced filling-in of the fracture lines since August 12, 1948, but they were still faintly visible (see Figure III).

2. An ear, nose and throat examination revealed retraction of the right ear drum with poor air entry on inflation.

This patient was readmitted to hospital on April 1, 1949, suffering from a further attack of meningitis, and was later discharged to convalesce. The features of this attack were as follows. (i) The onset was sudden and there was no evidence of recurrent ear infection. (ii) Lumbar puncture was not difficult, but no cerebro-spinal fluid could be obtained. (iii) No growth was obtained on attempted culture of the ventricular fluid. (iv) After eighteen days the intraventricular administration of penicillin was discontinued and the parenteral dosage was doubled. She has since made steady recovery. (v) After convalescence the fracture of the right petrous temporal bone will be repaired. Persistence of this fracture is believed to predispose the patient to recurrent attacks of meningitis.

Comment.

The case was of considerable interest, first of all in view of the development in a middle-aged woman of meningitis due to *Hæmophilus influenzæ*.

As a second feature the ununited fracture of the petrous temporal bone was regarded as the probable portal of entry of the organism following an ear infection. The most recent radiograph (Figure III) showed such progress in union that it is thought that this will be complete in about another twelve months—that is, approximately two and a half years after the fracture was sustained. In the sparse literature on the question of healing of linear fractures of the skull there is a considerable diversity of opinion. Illig stated that fracture lines in adults may remain demonstrable for many years, while Glaser and Blaine wrote that in the minority of such cases the fracture lines fade in six to nine months and disappear in twelve to eighteen months; in the majority these times are eighteen to twenty-four months and four to five years. In a second article these writers note that frontal, parietal and temporal fractures begin to fade immediately, while occipital fractures are usually considerably slower. They further add that in some cases, instead of radiographic disappearance of fracture lines, bone absorption may lead to a larger defect than that initially present. Vance states that linear fractures commence to look like old fractures after about eight months, and healing is completed in two years. Nowhere could specific reference be found to fractures of the petrous portion of the temporal bone.

Thirdly, the successful outcome of the present case, in which streptomycin was used, without the aid of influenzal antiserum was noteworthy. Goodfriend and Thurston suggest that if given early in the disease streptomycin alone is adequate for treatment; but Wilson, in his report to the Medical Research Council, concludes that it is advisable for sulphadiazine and penicillin to be given in addition. As in this case, overseas writers remark on the absence or insignificance of toxic effects following the use of streptomycin.

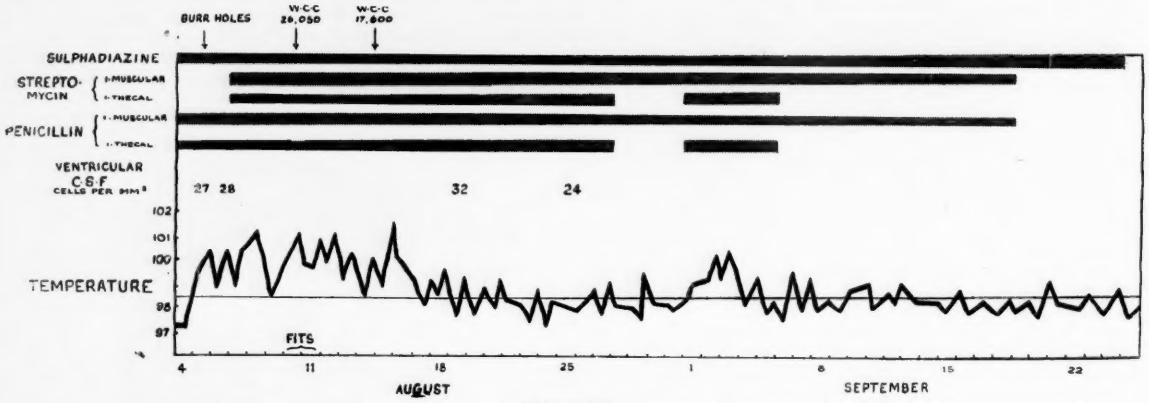

FIGURE II.

Chart showing progress in Case I. In the recording of the penicillin and streptomycin therapy, the darker zones represent intraventricular administration of the drugs.

Case II.

The second case was one of non-fatal *Streptococcus fæcalis* meningitis. The patient, a man aged thirty-eight years, was admitted to the Royal Melbourne Hospital on October 19, 1948, with the following history (which was obtained at a subsequent date). About 1930 he was involved in an accident while in New South Wales and suffered a depressed fracture of the skull. He underwent craniotomy later in that year on account of convulsions and of ataxia. Some months prior to his admission to this hospital he received a further injury to his head when he was thrown from a buggy. The illness under discussion commenced about October 16, with diffuse headache and vomiting, and later neck stiffness.

On examination the patient was pale, restless and incapable of giving any account of his illness. His temperature was 99·4° F., his pulse rate was 100 per minute and his blood pressure was 125 millimetres of mercury, systolic, and 65 millimetres, diastolic. Neck stiffness was pronounced and Kernig's sign was elicited, but otherwise no abnormal clinical signs were evident. Lumbar puncture produced turbid cerebro-spinal fluid at a pressure of 80 millimetres; the cell content of this fluid was 5750 polymorphonuclear cells and 50 lymphocytes per cubic millimetre.

When the diagnosis of meningitis was made, treatment was started as follows. Penicillin was administered intramuscularly in a dosage of 30,000 units *statim* and 20,000 units every three hours; penicillin solution was given intrathecally in a dosage of 15,000 units in five millilitres twice a day. Sulphadiazine was given, two grammes *statim* and one gramme every four hours.

During the day the patient suffered three generalized convulsive seizures, and penicillin dosage was increased to 100,000 units every three hours.

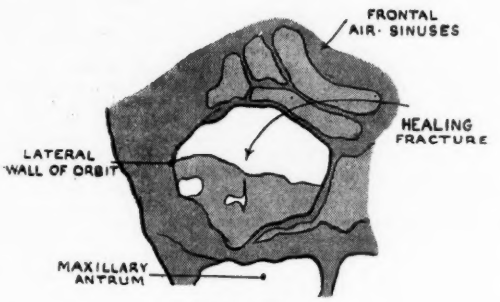

FIGURE III.

Case I: Drawing of antero-posterior radiograph of skull (December 17, 1948) showing progress in union of fracture.

An outline of his progress is given in Figure IV. Culture of the cerebro-spinal fluid obtained on the day of his admission to hospital produced a growth of *Streptococcus fæcalis*, and this organism was also grown from fluid obtained on October 20 and 21. The organism was found to be sensitive to penicillin in a concentration of four units per millilitre, and by October 22 the fluid was sterile. The penicillin dosage was maintained at its original level.

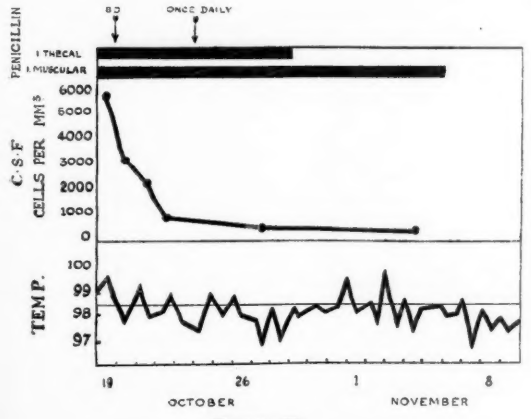

FIGURE IV.

Chart showing progress in Case II.

Radiographs of the skull revealed a large post-operative defect in the right parietal area. An ear, nose and throat examination revealed infected tonsils, culture of a swab from which grew green streptococcus, *Neisseria catarrhalis* and *Bacillus subtilis*.

The patient made steady progress and was discharged after twenty-two days in hospital. He has recently returned to the out-patient clinic and has been in good health apart from the recurrence of chronic "rheumatics" in the lumbar region.

Comment.

Some of the interesting features of this case were as follows.

1. The clinical picture presented by the patient. He was from the outset irritable and restless, but his general condition throughout was remarkably good. His fever was never extreme and at no stage did he appear to be gravely ill.

2. The repeated growth of *Streptococcus fæcalis* from the cerebro-spinal fluid without evidence of a source for the organism.

3. The rapid response to penicillin. This was shown both by his general improvement and particularly by the clearing of the cerebro-spinal fluid with rapid fall in the cell count. This was particularly gratifying in view of the usual response of this organism to penicillin, and since the concentration of four units of penicillin per millilitre was probably never achieved. Had penicillin not been effective in this case, Wilson's report suggests that the organism would have responded to streptomycin.

Acknowledgements.

I wish to thank Dr. Keith Fairley for permission to report these cases, and Mr. R. S. Hooper for his advice in the management of the patients and his help in the preparation of these reports.

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Addendum.

The patient described in Case I was readmitted to the Royal Melbourne Hospital from a convalescent hospital on June 9, 1949. Her general health was good. At operation a small temporo-parietal osteoplastic flap was made. The fracture of the petrous portion of the temporal bone was almost completely healed, except for the medial part where it was about one millimetre in width. There was no evidence of rupture of the dura, even when the *tentorium cerebelli* was incised to obtain adequate exposure. However, as a safeguard, a strip of pericranium from the region of the osteoplastic flap was placed over the upper surface of the petrous temporal at the site of fracture. The dural incision was closed, the osteoplastic flap replaced and the scalp resutured.

The conclusion must be stated that it is possible that the petrous temporal fracture was not the portal of entry of the meningitis organisms.

A CASE OF MYASTHENIA GRAVIS WITH THYMIC TUMOUR (RETICULO-ENDOTHELIOMA) AND DEVELOPMENT OF UNUSUAL EYE SYMPTOMS (PHOSPHENES).

By J. DE VIDAS, M.B., B.S., D.T.M., M.R.A.C.P.

THE object of this case report is not to add to the already well-informed literature on the subject, but to draw attention to the negative value of negative findings in ancillary methods of diagnosis of *myasthenia gravis* and to the relationship of thymic enlargement to that disease.

An enlarged persistent thymus is often, but not always, found in *myasthenia gravis*. Hyperplasia, round-cell tumours, endotheliomata and reticulum-cell tumours of the thymus have been described in *myasthenia gravis*. In Addison's disease, when there is extreme myasthenia, thymic hyperplasia may be present. It is well established that the motor disturbances of *myasthenia gravis* originate in the neuromuscular junction. Acetylcholine is freed at the end plate, and this renders the muscle fibres sensitive to nerve impulses. But if the acetylcholine is not liberated or is destroyed quickly, muscles do not contract. So far there is no convincing explanation linking thymic dysfunction with acetylcholine lack.

Clinical Record.

The patient, an unmarried, fair male, aged forty-one years, presented with a drooping upper right eyelid. He stated that he could not concentrate on his job of fitting and turning. On examination of the patient, the central nervous system was normal. Some improvement followed, but later he complained of slight difficulty in swallowing and also of being tired. As a therapeutic test, ephedrine and "Prostigmin" were injected intramuscularly. There was no response. A plain X-ray film of the mediastinum and examination with a barium bolus revealed no sign of thymic tumour or arrest of deglutition.

When taking "Prostigmin" and ephedrine tablets the patient felt subjectively much better. However, objectively no change was detectable. About six months after he had been first examined, the patient returned complaining that he saw coloured images in his left eye. They occurred whether the eye was open or shut. The colours were spectral and the shapes were wavy or circular. On examination, paresis of the left external rectus eye muscle and of the right upper eyelid and extrinsic eye muscles was found. The pupils reacted to light and accommodation. The fundi were normal. No changes were observed clinically in conjunctiva, lens, cornea, iris or ocular tension. X-ray examination of the skull, a Wassermann test and cerebro-spinal fluid examination all gave negative results.

The eye symptoms began to disappear in thirty-six hours, but they did not entirely go until a week after their onset. A fortnight after his admission to hospital the patient was discharged, apparently relieved.

One year later, the patient suddenly died. At post-mortem examination a large tumour of the thymus was found, five inches in length and three inches in breadth. It was attached firmly behind and loosely in front. Four small cavities containing yellow material (products of degeneration) were present inside the gland. No metastases were found. Examination of microscopic sections revealed large sheets of epithelium-like cells bound closely together and staining poorly. Some lymphocytes were seen between the sheets of cells.

Summary and Conclusions.

1. A case of *myasthenia gravis* associated with a reticulo-endothelial cell tumour of the thymus is described.

2. In spite of the large tumour found at autopsy and the myasthenic symptoms, the barium bolus and X-ray examinations failed to confirm the diagnosis, at least in the earlier stages of the illness.

3. Varying abnormalities of thymic enlargement occur in about 20% of cases of *myasthenia gravis*; the thymus does not completely atrophy but slowly involutes, so that remnants persist even in old age; in the earlier stages of this case the X-ray film did not show a thymic shadow. Accordingly one may postulate that in this case the reticulum-cell overgrowth may have been a response of thymic remnants to the disease.

4. Entopic phenomena (phosphenes) are described. Their cause lies in the alteration of the refractive index of the visual media and is probably associated in this case with "Prostigmin" therapy.

Reviews.

HAMLET AND ŒDIPUS.

SOME forty years ago the distinguished English psychiatrist, Dr. Ernest Jones, who was a close personal friend of the late Professor Freud and who was the first to practise psychoanalysis outside German-speaking countries, attempted to show that the Œdipus complex could throw much light on the behaviour of Prince Hamlet in Shakespeare's great drama. Dr. Ernest Jones in succeeding years returned to the theme, but has now expanded his analysis from an essay into a book, "Hamlet and Œdipus".[1] It is a tribute to Shakespeare's genius that even experienced critics have taken his outstanding characters as actual persons and speculated on their past and future as well as on their personalities and motives. One such commentator, distressed by the repudiation of Falstaff by Henry V, declared it was a comforting thought that the poor old man had tricked Master Shallow into letting him have one thousand pounds! A famous instance of this attitude was the question: "From the characters of Polonius, Laertes and Ophelia deduce that of Polonius's wife?" We can imagine that Shakespeare created these characters without any regard to hereditary affinities. Dr. Ernest Jones is well aware of this pitfall, but he proceeds with his exposition undeterred: "I propose to pretend that Hamlet was a living person", he asserts, giving as his reason that the character was based on Shakespeare's own personality and emotional experience, and so for every phase of Hamlet's feeling and utterance there was a parallel in the mind of his creator.

After a learned and detailed presentation of the problem of Hamlet and of the many possible explanations proffered—actually one was that Hamlet suffered from shellshock after the interview with the ghost—Dr. Ernest Jones proceeds to put forward his hypothesis that the Œdipus complex supplies the clue. The main element in this complex is "the resentment felt by a boy towards his father when the latter disturbs, as he necessarily must, his enjoyment of his mother's exclusive affection. This feeling is the deepest source of the world-old conflict between father and son and so between the younger and the older generation". Freud denied that sexual passion started at puberty; the vehement attachments and jealousies of childhood he based on the sexual instinct, declaring that as a child must learn to walk, so he must learn to love. That Hamlet regarded his father with profound admiration does not disturb Dr. Ernest Jones at all; he is capable of fitting this into his scheme. The author is on sure ground when he holds that Hamlet was more upset by his mother's frailty than by his father's murder, and he admits quite candidly that when Hamlet upbraids his mother with such fury of reproaches that she actually dreads physical violence, he was displaying something like the Orestes complex, but again he dexterously parries this difficulty. The attitude of the reader of this book will vary according to his views on Freud's contribution to psychology. To some it will be a convincing and inspiring masterpiece of constructive criticism; on the other hand those who hold that the semiorientalism of Freud in which the animate world rotates around a lingam pivot cannot be applied to Anglo-Saxon behaviour, will dismiss the book as far-fetched. Like all writers who find in sex an explanation of most happenings in life, Dr. Ernest Jones has laid himself open to serious criticism. For instance, he quotes Dover Wilson with approval as stating "a strain of sex nausea runs throughout almost everything Shakespeare wrote after 1600". It was in this period that *The Tempest* was written, often described as the most beautiful love story in the literature of the world. And where is the sex nausea in the Imogen of Cymbeline? Again he quotes the Brutus of Shakespeare: "Not that I loved Cæsar less but that I loved Rome more", and informs us that "cities are unconscious symbols of the mother". Surely it must be obvious that the solicitude of the conspirators was directed not so much towards the city of Rome as towards the majestic republic which they feared, and with good reason, to be slipping into a dictatorship. The next thing we shall be told is that when Macaulay in his Horatius made a Roman say, "Then none was for a party, then all were for the state", he had identified in his mind party with the father and the state with the mother! It will be interesting to find Dr. Ernest Jones tackling other Shakespearean problems with the same Œdipus clue. The great dramatist was prone to depict brothers at variance—even in the happy woodland make-believe of *As You Like It* two pairs of brothers are

[1] "Hamlet and Œdipus", by Ernest Jones, M.D., F.R.C.P.; 1949. London: Victor Gollancz, Limited. 8½" x 5½", pp. 170. Price: 12s. 6d.

at each other's throats. Throughout the plays we find brother defrauding, banishing and even, as in Hamlet, murdering brother. Is it that brothers are rivals for their mother's affection and so must be hostile to each other? Again, why was Shakespeare so curiously reluctant to bring in the mother-daughter relationship? Has this also an Œdipus foundation?

The book undoubtedly shows deep scholarship in Shakespearean exegesis. One minor criticism may, however, be put forward. Twice Dr. Ernest Jones states that, in the second quarto of Hamlet, Shakespeare revised the action and wording of the first quarto. He may be right, but this is a very risky inference, for though Shakespeare's hand is obvious in the second quarto, it is anything but obvious in the first which was one of the "stolne and surreptitious copies", that is, pirated copies, denounced by the editors of the first folio. In the words of Dr. Alfred Hart it is "a garbled abridgment of an acting version" and must therefore remain suspect. One must also mention the possibility that Shakespeare, when he altered and expanded the drama, was not always consistent. Lack of consistence of characterization is easily discernible in certain of the works of Dickens, Victor Hugo and Charles Reade. In the final scene of Hamlet the queen remarks that her son is "fat and scant of breath". This may have been thrust in to suit the actor playing the part, but we decidedly refuse to believe that the Hamlet of the preceding scene and four acts could be so described.

A SUPPLEMENT TO THE BIOGRAPHY OF LISTER.

ONE cannot imagine that the classical biography of Lord Lister, written by his nephew, Sir Rickman Godlee, will be ever surpassed as the most complete and authoritative book of reference on the life and work of this great benefactor to humanity. The author of this comprehensive study was eminently fitted to undertake such a responsible commitment by reason of his close family connexion with Lister, his proximity to the times and events worthy of recording, and his high professional status as a practising surgeon with a rich experience in the evolution of modern surgical technique. In one significant respect, however, the biographer was obliged to exercise considerable restraint owing to Lister's insistence that the subject matter of the book should be strictly limited to the account of his academic and scientific activities, and that all reference to his personal or domestic affairs should be prudently avoided. To some extent this regrettable omission is substantially mitigated by the recent publication of a short biographical sketch with the title "Joseph Lister: The Friend of Man",[1] and it is written by Dr. Hector Charles Cameron, a son of the late Sir Hector Clare Cameron, who was an enthusiastic disciple of Lister from the early Glasgow days and was one of the few who enjoyed the privilege of the great surgeon's intimacy right to the end.

In the opening chapter Dr. Cameron writes interestingly of his own recollections of Lord Lister on the several occasions when he visited Sir Hector Cameron's home in Scotland, and he relates many fascinating anecdotes garnered from the store of his father's retentive memory or from the conversation of such faithful adherents as John Stewart, of Halifax, Watson Cheyne and Sinclair Thomson. When Dr. Cameron was a student at Guy's Hospital he was invited to Lister's house in Park Crescent, London, where he found himself dining alone with the great man. His friendly host took the opportunity of imparting a little surgical wisdom for the benefit of the young medical student, and in the course of conversation told him rather confidentially of his worried experience when called upon to treat Queen Victoria for a deep-seated abscess. Obviously, he wanted to point the moral of resourcefulness in surgical practice by telling how his difficulties were resolved after he had thought of employing a section of rubber tubing from his spray apparatus to promote free drainage through the wound.

In an earlier chapter we find a good picture of the Quaker home in which Lister received his first impressions and which helped in no small measure to strengthen the nobility of character and lofty idealism which later gave added distinction to his scientific achievements and to his public life. As members of his particular religious persuasion were denied the main avenues of professional advancement, it turned out happily that the choice of a non-sectarian institution for his academic training was restricted to the University of London, where he entered University College and received the best of instruction in the humanities and later in medicine. After graduation he left England behind him for similar reasons and sought to extend his knowledge in the more congenial atmosphere of the medical centres in Scotland.

As the book continues we find many unconventional accounts of Lister's rapid absorption into the varied surgical activities of Edinburgh under the friendly guidance and help of Professor James Syme, and of the circumstances which so irresistibly brought him under the spell of Syme's eldest daughter, Agnes, a happy association that was to mean so much to him in the difficult and laborious days ahead. Later, we are admitted to the intimacy of that poignant scene at Rapallo in Italy, as Lister with the mantle of fame already upon him, is sorely stricken by the loss of his wife in the sudden onslaught of acute pneumonia. With all ambition gone, Lister entered upon his declining years completely unaffected by the honours showered upon him from all quarters of the globe, constantly irritated by the cultivated prejudices and inherent stupidity of a number of surgical Philistines who should have known better, and weighed down by the sorrow that he seemed quite unable to overcome.

Needless to say ample space is given in the book to the early experiments and research on inflammation and wound infection and to the evolution of the antiseptic principle in surgery, all of which may be read again with profit, as many of us may be even now a trifle ignorant in regard to Lister's original line of thought. The illustrations include subjects with which we are not so familiar, and there is a hitherto unpublished facsimile of a letter from Lister to his father telling of satisfactory progress being made in the preliminary trial of antiseptics in the treatment of compound fractures.

[1] "Joseph Lister: The Friend of Man", by Hector Charles Cameron; 1948. London: William Heinemann (Medical Books), Limited. 8¼" × 5¼", pp. 194, with illustrations. Price: 17s. 6d.

THE ALPHABET OF THE DIABETIC LIFE.

No fundamental changes mark the tenth edition of "The Diabetic A B C" by R. D. Lawrence.[1] The principles of treatment remain unaltered and the author, with the assistance of his dietitian, Miss Lilian Pearce, has tried to introduce new recipes to vary the continuing monotony of British post-war diet. The small volume still remains as the senior, most simple and most compact answer to the proposition "what every diabetic should know". There are many companions to this little volume in many lands, but no superiors. It records in plain language, unassisted by any illustrations or diagrams, the essential alphabet of the diabetic life. The food tables, recipes and menus are strictly for the diabetic who pursues Dr. Lawrence's famous "Line Ration Scheme", which provides, for the intelligent, a wide variety of fare, but which in our experience is often difficult to teach to "clinic" patients—at least at the outset of their diabetic education. No mention is yet made of the standard insulin syringe, nor of the convenient urine testing tablets now available. This handbook for patients will continue to serve the as yet undiscovered diabetic community with the same faithfulness as that with which it has guarded the known diabetics of the British Commonwealth during the past ten years.

ESSENTIALS OF ORTHOPÆDICS.

THE author has written "Essentials of Orthopædics" primarily for the needs of the general practitioner, the undergraduate student and the graduate student who is commencing his surgical training.[2] The title "Essentials of Orthopædics" is well chosen and accurately describes the presentation of the subject matter.

It is very well produced and well illustrated. The author has a lucid style, with the result that the book is extremely easy to read. A proper perspective of the various subjects discussed can be obtained, important points are stressed and non-essentials given their due place.

The various disabilities are considered under a regional basis. Disease which is widespread and occurs in various parts of the skeletal system is then dealt with as a whole

[1] "The Diabetic A B C: A Practical Book for Patients and Nurses", by R. D. Lawrence, M.A., M.D., F.R.C.P. (London); Tenth Edition; 1948. London: H. K. Lewis and Company, Limited. 5" × 7½", pp. 80.

[2] "Essentials of Orthopædics", by Philip Wiles, M.S. (London), F.R.C.S. (England), F.A.C.S.; 1949. London: J. and A. Churchill, Limited. 9¾" × 6", pp. 508, with 365 illustrations and 7 coloured plates. Price: 42s.

at the end of the volume. The treatment of fractures has been wisely omitted from consideration in this volume. Very little has been omitted of new concepts of both pathology and treatment of various conditions. There is a good chapter on posture and the part that it plays in spinal deformities and also deformities and conditions of the lower limbs and feet in children and in adolescents. The author logically analyses their cause and treatment. Disabilities of the shoulder, tennis elbow, disabilities of the knee, low backache, and osteomyelitis are subjects which are all excellently presented.

It is felt that some mention should have been made, in the description of the after-effects of poliomyelitis, of those difficult cases in which muscle spasm persists for some time in addition to the paralysis. Also the value of warm baths could have been stressed as an aid to treatment in the early stages when the muscles are painful and in spasm. Sister Kenny has been quick to seize on these points in treating patients and insists on continuous hot foments. Otherwise it is a really excellent volume and can be confidently recommended for those for whom it is written, and, in addition, any practising orthopædic surgeon will find in this work an excellent concise summary of modern orthopædic thought and procedure.

SKIN DISEASES IN GENERAL PRACTICE.

DR. F. RAY BETTLEY'S book, "Skin Diseases in General Practice", is, as the name implies, essentially a book for the non-specialist.[1] It is a small work of two hundred and sixty pages, and it deals only with common skin diseases, a clear knowledge of which is essential to the general practitioner. By thus limiting the subject matter, the author has been able to deal more fully with the clinical features, diagnosis and treatment of common dermatoses than would otherwise be possible in a book of this size. Many will feel, however, that the number of diseases described has been too drastically limited, particularly in view of the fact that no less than eighteen pages are devoted to the subject of patch testing. Urticaria, furunculosis and varicose ulceration, for example, surely deserve more than a mention in a book such as this.

The style is lucid and dogmatic, as indeed it should be in a handbook of this nature. The subject matter is presented in an essentially practical manner, especially in regard to therapy, and it is noteworthy that the number of prescriptions has been kept to the essential minimum. The therapeutic procedures outlined are, for the most part, generally accepted, and open to little criticism. Most Australian dermatologists, however, will disagree with the author's opinion that prickle-cell and intermediate types of epithelioma are often best treated by methods other than irradiation; and many will condemn his use of diathermy as a routine treatment for superficial epitheliomata of all types.

The paper and printing of this book are good; and the illustrations, of which there are ninety-six (in black and white), are exceptionally clear and well chosen. This is a book which will undoubtedly prove very useful to general practitioners and students alike.

SELECTED ANATOMY.

"SURVEYS OF ANATOMICAL FIELDS" gives concrete expression to a device employed by the senior author while conducting a correspondence course in anatomy for medical officers in the services.[2] The method was to present special regions for study by the superposition of soft parts upon the bones as seen in X-ray photographs. In this particular the method is comparable to the relatively common employment of superimposed transparencies for the same purpose, but in practice the student's attention was focused upon the most important landmarks and he was, quite properly, expected to take an active part in his own education by writing essay-like commentaries. The plan is carried over into the book which covers only a few regions, although more are envisaged for future publication. Some of the regions dealt with are of great value, particularly the transition zones of the shoulder and groin which the student tends to lose sight of as he passes from one manual to the next. In each case the bony foundation is laid down and successive layers of soft structures are built over them. The steps in such synthesis are illustrated by successive black and white line blocks. Here, however, the major purpose of the authors has been largely defeated by the artist's failure to employ this rather restrictive medium to full advantage. In many cases superposition of the successive layers results in a progressively more obscure and confusing picture, unrelieved by highlights or any of the other devices usually relied upon by black and white artists to clarify their intent. The first chapter of the work is devoted to a discussion on anatomical instruction. Many of the comments made there are just, but the strictures upon anatomical artistry—particularly in view of the illustrations that follow—seem unduly severe. While we may admit, as Frank pointed out some years ago, that the hey-day of such artistry passed a century ago, it must be conceded that modern artists are still capable of very good work—even though, as the authors aver, they do look a bit around the corner at times. Orthogonal projections are very well for the drawing of bones, as Albinus and, particularly, Pieter Camper discovered over two centuries ago. Such projections, however, appear a trifle procrustean for the soft parts whose very mobility is the essence of life, but fixation the symbol of death. The authors intend their book to supplement the regular manuals and text-books for use by those who have done a reasonable amount of dissecting. The appeal, therefore, is likely to be limited. The question also arises, whether such a work, divorced from the reciprocal discipline of comment writing, can hope to attain the success claimed for the original dossier correspondence course system. At all events, while not original in any essentials, the book provides a change from the usual works on human anatomy.

[1] "Skin Diseases in General Practice", by F. Ray Bettley, T.D., M.D., F.R.C.P.; 1949. London: Eyre and Spottiswoode (Publishers), Limited. 8¼" × 5¼", pp. 264, with 96 illustrations. Price: 21s.

[2] "Surveys of Anatomical Fields", by Joseph L. Shellshear, D.S.O., M.D., M.S., and N. W. G. MacIntosh, M.B., B.S.; 1949. Sydney: Grahame Book Company. 9¼" × 7", pp. 188, with 66 illustrations.

Books Received.

[The mention of a book in this column does not imply that no review will appear in a subsequent issue.]

"Sex in Social Life", edited by Sybil Neville-Rolfe, O.B.E., with a foreword by Sir Cyril Norwood; 1949. London: George Allen and Unwin, Limited. 8¼" × 5¼", pp. 506, with illustrations. Price: 21s.

Written for the general public by fifteen contributors.

"Textbook of Histology", by José F. Nonidez, D.Sc., and William F. Windle, Ph.D., Sc.D.; 1949. New York, Toronto and London: McGraw-Hill Book Company, Incorporated. 9" × 6", pp. 470, with 287 illustrations. Price: $6.75.

Intended for the beginner.

"Malaria Control by Coastal Swamp Drainage in West Africa", by A. B. Gilroy, O.B.E., M.B., B.S. (Melbourne), D.T.M. and H. (England); 1949. London: Ross Institute of Tropical Hygiene. 8¼" × 5¼", pp. 128, with many illustrations.

An account of work carried out in Lagos.

"The Medical Clinics of North America" (issued every two months); 1949. Philadelphia and London: W. B. Saunders Company. Melbourne: W. Ramsay (Surgical) Proprietary, Limited. New York Number. 8¼" × 5¼", pp. 330, with illustrations. Price: £5 5s. (paper binding) and £6 6s. (cloth binding) per clinic year.

This is a "New York Number" consisting almost entirely of a symposium on cardio-vascular diseases with special reference to hypertension.

"A Child's Eyes", by Richard G. Scobee, B.A., M.D., F.A.C.S.; 1949. St. Louis: The C. V. Mosby Company. Melbourne: W. Ramsay (Surgical) Proprietary, Limited. 8¼" × 5¼", pp. 114, with 19 illustrations. Price: 15s.

Written for the information and instruction of parents.

"Frustration: The Study of Behavior without a Goal", by Norman R. F. Maier; 1949. New York, Toronto and London: McGraw-Hill Book Company, Incorporated. 9" × 6", pp. 274, with illustrations. Price: $3.50.

The report of an experimental investigation into frustration.

"A Practice of Orthopædic Surgery", by T. P. McMurray, C.B.E., M.B., M.Ch., F.R.C.S. (Edinburgh); Third Edition; 1949. London: Edward Arnold and Company. 8¼" × 5¼", pp. 452, with 191 illustrations. Price: 30s.

An attempt to give a description of the basic principles which underlie treatment in orthopædic surgery.

The Medical Journal of Australia

SATURDAY, SEPTEMBER 24, 1949.

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A NEW TUBERCULOSIS ACT IN TASMANIA.

ONE of the four divisions of the Department of Public Health of Tasmania is concerned with the control of tuberculosis; the other divisions have to do with public health and maternal and child welfare, hospitals and medical services, and mental hygiene. The Division of Tuberculosis has a full-time director, who has charge of the preventive and therapeutic aspects of tuberculosis work; the former includes the mass X-ray service carried out by the department. The Director of the Tuberculosis Division, Dr. T. H. Goddard, has recently put together an account of the work carried out by his division in 1948. Attention has been directed to the tuberculosis problem in Tasmania by reason of the fact that the Tasmanian Parliament has put on the Statute Book a new *Tuberculosis Act*. This Act, which must be regarded as a piece of experimental legislation, because of the fact that it is to expire on June 30, 1950, should be considered in the light of what the department is doing and has already done.

There are two sanatoria in Tasmania, one in Hobart containing 100 beds, and one at Perth near Launceston of 35 beds (being increased at present to 50). At the Infectious Diseases Hospital in Hobart 12 beds are available and an operating theatre is being installed so that chest surgery may be undertaken there. The Repatriation Department has a tuberculosis hospital of 50 beds; 12 beds are available at the Royal Hobart Hospital, mostly for chest surgery, and four at the Launceston General Hospital. There are two chest clinics, one at Hobart and one at Launceston. A third clinic is under construction on the north-west coast of the island. The work of the clinics is summarized as follows: (i) Investigations are made of patients whose condition is suggestive of tuberculosis and who are referred by outside practitioners. (ii) Contacts of persons whose infections have been notified are examined periodically. (iii) Patients discharged from sanatoria are supervised; artificial pneumothorax treatment is continued and general supervision is exercised. (iv) Visits are paid to "notified" patients for whom sanatorium treatment was not considered necessary. (v) Investigations are carried out in those cases in which suggestive appearances are found on mass X-ray examination. (vi) A check is kept for at least two years on patients suffering from pleural effusion who have been discharged from general hospital with findings not sufficiently definite to warrant a diagnosis of active tuberculosis. Mass X-ray examinations of the population are carried out at three centres—one is in Hobart and one in Launceston and one is a travelling unit. A plant is about to be installed at the Royal Hobart Hospital and a transportable plant is to be installed in Launceston. The bacteriological work for sanatoria and clinics is carried out at the Commonwealth laboratories at Hobart and Launceston. During the year 1948 the number of persons notified to the Department of Public Health as suffering from pulmonary tuberculosis was 168. Tuberculous infections other than pulmonary numbered 20. Of the 168 patients with pulmonary tuberculosis 53 were over forty-four years of age and 43 of these were males. Seven patients were under fifteen years of age. More than one-third of the infections were in an early stage when they were first discovered, and more than 44 of the cases were brought to light by the mass X-ray examinations of the department. During the year 80 deaths from pulmonary tuberculosis were recorded, 40 of the persons being over forty-four years of age; six persons died of non-pulmonary tuberculosis and four of them were over forty-four years of age. These figures are of interest because of the fact that tuberculosis is looked on as a disease affecting young rather than middle-aged persons. Dr. Goddard attaches importance to them owing to the fact that persons over forty-five years of age did not come forward for X-ray examination of the chest as readily as those of the lower ages did. All but 25 of the patients were treated in hospital and ten of the 25 were not regarded as needing institutional treatment. At no time has the department had a waiting list for hospital beds of any significance. During the year 36,516 persons were submitted to mass X-ray examination; 18,408 of them had not previously been examined in this way. When a miniature film suggested the presence of an abnormality a larger film was taken. Of the 270,000 people in Tasmania approximately 170,000 are over fourteen years of age, and of these 73,000 have been examined by X rays since the mass X-ray campaign was started in 1945. This short statement will give some idea of the kind of set-up with which the new legislation was designed to cope.

The new Act is known as the *Tuberculosis Act*, 1949. It provides for notification by a medical practitioner to the Director of any person who "is or may be" suffering from tuberculosis, or who is revealed by post-mortem examination to have been suffering from tuberculosis at the time of his death. The notification is required to state whether the disease is in active form or whether the patient is in an infectious condition. On receipt of a notification the Director is required to ensure the medical examination of all persons who have been in close association with the patient and to do all other acts and things needed to give effect to his powers under the Act. The Director is required to "have regard to the opinion of the medical practitioner by whom any person is being or has been professionally attended" in respect of the diagnosis, infectivity or the nature and extent of necessary examinations. If any dispute arises between the Director and the medical attendant the matter is referred to a board.

Boards consist of three medical practitioners practising as physicians, appointed by the Governor and holding office during his pleasure.[1] The Minister may, by notice published in the *Gazette*, require persons over fourteen years of age to undergo radiological examination of their lungs; but this will not apply to any person who holds a certificate from his medical attendant or from an officer of the department to the effect that, within a period of twelve months preceding gazettal of the notice, he has undergone a radiological examination of the lungs. If the Director has reason to believe that any person is suffering from tuberculosis and has refused or failed to undergo a medical or other examination on that account, he may direct that person to undergo such radiological, medical and bacteriological examinations as he may deem necessary. In certain circumstances the Director may nominate a medical practitioner to make the examination at a special place approved for the purpose. In respect of a person who is a "child", that is, under the age of seventeen years, notices are given to parents or guardians. When the Director is satisfied that a patient is in an infectious condition he may apply to a board and the board may in certain specified circumstances order the patient to be removed to an institution "where he can be properly attended and treated" and detained for a period not exceeding six months. As this is one of the most important provisions of the Act the circumstances justifying removal to an institution are set out in full. The conditions are as follows: (*a*) the patient is suffering from tuberculosis and is in an infectious condition; (*b*) in the patient's interests he should be properly attended and treated; (*c*) the patient's circumstances are such that proper precautions to prevent the spread of the infection cannot be taken, or that such precautions are not being taken; (*d*) substantial risk of infection is or will thereby be caused to other persons; and (*e*) accommodation is available in a suitable institution or place. If at the end of six months the Director deems it necessary, he may apply to the board for a further detention of the patient, and in this way the patient may be detained for a period not exceeding, in the aggregate, three years. On the other hand at any time during the currency of an order the patient may apply to the board for a revocation of the order, and the board, if it thinks fit, may revoke the order. If a patient refuses to obey an order, he may be apprehended on a warrant issued by a justice. Any person who without lawful excuse disobeys any notice or order under the Act, who obstructs, delays or interferes with any order, or who contravenes or fails to comply with any provisions of the Act, will be guilty of an offence and the penalty will be fifty pounds or imprisonment for three months.

It should be noted that the patient is removed to an institution "where he can be properly attended and treated". At the same time a special section of the Act prohibits compulsory treatment. This is as it should be. The Legislative Council of the Tasmanian Parliament took the commendable step of seeking the advice of the Tasmanian Branch of the British Medical Association on the provisions of the Act and the Branch stated that the medical profession recognized that in the control of tuberculosis some degree of compulsion was necessary, but that, generally speaking, it was opposed to any compulsion of the individual in medical matters. What the present Act does is to attempt to isolate the tuberculous patient who is likely to be a danger to other people. The rights of the individual appear to be preserved, for he is at liberty to take his own precautions. The point that should be insisted on is the urgent need for adequate provision to be made for the family of the patient. The Director of Tuberculosis in his statement gives a list of the payments that are made to notified sufferers from tuberculosis. Examples of the total weekly income received by a sufferer who is in receipt of all available benefits, including social service, child endowment and tuberculosis allowance are as follows: A man and wife receive £4 11s. 6d. a week; a man, wife and one child receive £5 5s. 6d.; a man, wife and two children receive £6 0s. 6d. and a man, wife and five children £8 5s. 6d. A man and wife do not receive the basic wage; and the basic wage alone would be inadequate, for it would give the two persons enough for only the bare necessities—and these are not sufficient for those in a tuberculous *milieu*. As already pointed out, this Act must be looked on as experimental. Unless the payments to tuberculous patients and their immediate dependants are revised, and revised promptly, any conclusions drawn in June, 1950, will be worthless, and in the meantime hardship is being inflicted on those who cannot endure it.

[1] The appointment of two boards, one for Hobart and one for Launceston, has been gazetted (see page 480).

Current Comment.

THE ERYTHROPOIETIC EFFECT OF COBALT.

THE value of cobalt in the treatment of certain types of anæmia occurring in sheep and cattle has been recognized for some years, the name of E. J. Underwood, of Western Australia, being particularly associated with the related pioneer work. Apparently the injection of cobalt is not effective; it must be absorbed by way of the alimentary tract, and in practice is added, in the form of one of its salts, to the animals' diet or to fertilizers used on the soil from which their food grows. The place of this trace element in human nutrition has not been clear, although useful research work has been carried out in Germany, Britain and the United States, and interest has been heightened by the recent discovery that cobalt forms an essential part of vitamin B_{12}. The erythropoietic effect of cobalt has been the subject of an important study by L. Berk, J. H. Burchenal and W. B. Castle,[1] cobaltous chloride being administered first to a group of hæmatologically normal patients and then to patients with types of anæmia refractory to recognized forms of treatment. It was found that the daily oral administration of 300 milligrammes of cobaltous chloride to 17 patients not suffering from anæmia produced slight reticulocyte responses in all cases within a week. Of 10 patients given the drug for over four weeks, moderate increases in red blood cell, hæmoglobin and hæmatocrit values were observed to occur in all but one. Similar doses of cobaltous chloride were given to 32 patients with various types of anæmia refractory to other forms of therapy, the medication being continued for over four weeks in 20 cases. In two of five patients with moderate anæmia associated with chronic infection, in one of two patients with hypochromic anæmia associated with inoperable carcinoma of the stomach and in one patient with familial microcytic (Cooley's trait) anæmia, definite reticulocyte responses and rises in red cell, hæmoglobin and hæmatocrit values were observed to occur. In only three of 16 cases of leuchæmia and lymphoma

[1] *The New England Journal of Medicine*, May 12, 1949.

was even suggestive evidence obtained of ability to maintain higher erythrocyte and hæmoglobin levels, and five patients with refractory anæmia and hypercellular bone marrow, one with cirrhosis of the liver and two with chronic renal failure failed to respond. To this series of results may be added the findings of J. C. Robinson, G. W. James and R. M. Kark,[1] who treated nine patients suffering from chronic suppurative infections with 20 to 60 milligrammes a day of cobaltous chloride given by mouth for a period of two to eleven weeks; in all cases reticulocytosis was observed within six days, and this was followed by increases in red cell counts, in hæmoglobin and hæmatocrit values, in blood volume and in total circulating hæmoglobin values.

Two important questions arising from this work, and linked with one another, are the mechanism of action of cobalt in producing hæmatopoiesis and its possible clinical value. Berk *et alii* point out that the reticulocyte responses recorded occurred within ten days of the institution of cobalt therapy, and so resemble in their chronology those resulting from hæmorrhage, anoxia, or administration of iron or liver extract under circumstances appropriate to each. This is seemingly consistent, they state, with the possibility that cobalt interferes with the transport of oxygen in the erythroid cells of the bone marrow because of its ability to form oxygen-binding complexes with certain amino acids such as cysteine and histidine. If so, the agent should raise the hæmoglobin level in patients with little or no anæmia rather than in those with severe anæmia, in whom a powerful anoxic stimulus to erythropoiesis presumably already exists. This possibility of interference with tissue respiration and the recording of obvious toxic effects in certain patients indicate the need for further study of the toxicity of the drug. The response obtained in certain patients of the two series referred to suggests that cobalt salts may be effective when other forms of treatment have failed; the response of the patient with familial microcytic (Cooley's trait) anæmia is a case in point. However, it seems clear that at present the use of cobalt salts in man can be justified only in the treatment of anæmia resistant to accepted forms of treatment and then with caution.

THE SURGICAL TREATMENT OF VARICOCELE.

THE desirability or otherwise of the surgical treatment of varicocele has aroused great controversy. During the recent war operative intervention for the treatment of symptoms complained of by a soldier with a varicocele was frowned upon, and there seemed to be little to do to deal with the symptoms. R. O. Olsen and E. P. Stone[2] state that in the United States forces low scrotal-vein ligation, the operation in vogue before 1942, had fallen into disrepute because of persistence of symptoms and the frequency of surgical complications; then a new and surprisingly effective operative technique was introduced. This technique, as described by C. T. Javert and R. L. Ciark,[3] consists in essence of ligation of the internal spermatic vein at the internal inguinal ring, ligation of the hernial sac (if present), muscular suspension of the testicle and herniorrhaphy (if necessary). The principle of the operation is based on the following contentions. The venous circulation of the testicle is composed of a primary or deep system (the internal spermatic vein originating in the pampiniform plexus, the vein of the *ductus deferens* and the external spermatic vein) and a secondary or superficial system (the superficial and inferior epigastric veins, the superficial internal circumflex vein, and the scrotal tributaries of the superficial and deep external pudendal veins and the internal pudendal vein); the external spermatic vein and its cremasteric branches connect the two systems. The varicocele is due to a distension of the pampiniform plexus by a static column of blood in the internal spermatic vein. Ligation of the internal spermatic vein at the internal inguinal ring does not interfere with the collateral venous circulation between the two venous systems through the pampiniform plexus, but it eliminates the column of blood producing the varicocele. This approach also permits correction of the inguinal hernia, if one is present, and suspension of the testicle. The old type of operation through the scrotum for excision of the internal spermatic veins at their point of origin and, to a lesser extent, ligation of the internal spermatic veins at the external inguinal ring interfere with the collateral circulation between the primary and secondary systems, and the operative result is unsatisfactory. Javert and Clark claimed that the combined operation (modified to suit the individual patient) gave uniformly satisfactory results, both symptomatic and anatomical. Olson and Stone claim similar satisfactory results in 21 of their 25 cases. It is interesting to note that four of the patients were being or had been treated for psychoneurosis and in all four cases the results of operation were excellent; Olson and Stone are of the opinion that the role of psychoneurosis in this condition has been overstressed in the past. The coincidental repair of hernia, if present, is made possible by this operation and apparently adds to its success. If other surgeons are obtaining comparable results with this operation it will be welcomed as a solution to an annoying clinical problem. Olson and Stone point out that the operation appears to be contraindicated in atypical cases in which the varicocele is but an incidental part of another pathological entity causing symptoms of its own, and they rightly stress that if symptoms do not conform to the standard pattern (gradually increasing scrotal enlargement, aggravated by assumption of the erect posture and by exertion, with a sense of heaviness in the scrotum followed by pain essentially of the traction type), other disease should be suspected.

[1] *The New England Journal of Medicine*, May 12, 1949.
[2] *The New England Journal of Medicine*, June 2, 1949.
[3] *Surgery, Gynecology and Obstetrics*, December, 1944.

RECENT LITERATURE ON POLIOMYELITIS.

POLIOMYELITIS is a very pertinent subject at the moment, and we should like to call attention to some important contributions to medical literature on the subject. The first of these is a symposium of ten papers,[1] nine by leading American workers in this field and one by a distinguished Danish investigator. John R. Paul, who was responsible for organizing the symposium, explains in a foreword that, if the series of articles can be said to have a central theme, it is the medical aspect of the acute disease—the virus infection of poliomyelitis. To supplement that central theme an attempt has been made to include what precedes the acute disease and what follows it in relation to the natural history of poliomyelitis. The ten papers deal respectively with epidemiology, viruses, immunity, the histopathological basis of clinical findings, the pathological physiology, clinical aspects, moist heat in treatment, bulbar poliomyelitis, care of after-effects and public health considerations. Paul, in discussing whether the symposium is justified in view of the amount already written on the subject, points out that the papers contain material which is "both timely and new" and cites some instances of this. In two of the papers, for example, attention is drawn to a relative shift in the age prevalence of poliomyelitis in America and Europe, a greater percentage of cases being found among adolescents and young adults than there was a generation ago. The manner in which adult poliomyelitis differs from old-fashioned "infantile paralysis" is indicated, with emphasis on the point that absence of such knowledge in the past has caused confusion and difficulty in the diagnosis of poliomyelitis of adults. Another statement in relation to the clinical picture is that the clinician cannot pass lightly over the abortive and non-paralytic cases of poliomyelitis, even though their significance is trivial as far as a serious result to the patient is concerned; the line which separates the non-paralysed from the paralysed patient is very fine indeed, and the clinician has an important responsibility to protect non-paralysed patients from anything which may upset the delicate balance which determines whether or not the degree of central nervous

[1] *The American Journal of Medicine*, May, 1949.

system involvement will be sufficient to cause clinical paralysis. Of particular interest in relation to the management of the disease is a paper on the bulbar form; the mechanism of the changes observed is discussed and details are given of modern principles of treatment, which are concerned with a great deal more than just the use of the rather spectacular respirator. The after-care of patients, considerations of physical therapy and the orthopædic approach are not neglected in the symposium, but they are not dealt with *in extenso* in view of the primary theme. The virus which is now believed to cause the disease receives attention and it is indicated that a small but definite family of poliomyelitis viruses exists. It has been found that repeated experimental infections with heterologous strains of virus can be produced in the same animal, and it seems likely that second attacks of poliomyelitis in man may be due to reinfection with different strains of the virus; the suggestion from this is that the best chance for artificial immunization rests upon an appreciation that the immunizing agent or agents should perhaps be "polyvalent" or at least should have a broad antigenic component. It would not be practicable to add more here to these few highlights, but the symposium can be commended to all who wish for an account of modern concepts of poliomyelitis and its management, particularly in the acute phases.

Another paper which should be known is a statement by the Therapeutic Trials Committee, a standing committee of the Council on Pharmacy and Chemistry of the American Medical Association;[1] it is concerned with methods of clinical study and evaluation of therapeutic agents in poliomyelitis and is the fruit of the experience of a subcommittee which, together with a number of consultants, studied for nearly two years the question of moist heat in the treatment of poliomyelitis at the request of the National Foundation for Infantile Paralysis. As an important by-product of these studies, certain principles became evident which were applicable to the evaluation of any agent advocated for the treatment of poliomyelitis These principles are presented in the statement in the hope that they will prove useful to any who may be charged with the task of testing the effectiveness of some new agent in this disease. The theme of the statement is briefly that poliomyelitis is a disease characterized by extreme variability in its course and in the degree of disability produced in victims. Many of the variables (these are listed and discussed) must be controlled in any investigation of the efficacy of a therapeutic agent, and because of their number it is necessary to observe a large number of patients, a requirement involving a collaborative effort on the part of a number of institutions. The methods proposed for investigation and evaluation are considered in detail and merit the study of those who may be concerned in such investigations. A salutary reflection after perusal of this statement is that, if those who investigate methods of treatment of this disease under controlled conditions and with large series of cases must observe strict care to avoid pitfalls, it is foolish for the casual clinical observer to generalize. Recognition of this fact would mean less argument and better treatment.

COLLATERAL PULMONARY VENTILATION.

COLLATERAL VENTILATION of the lungs is not by any means a new conception, but it has been an unfamiliar one to the physician because it has had until recently no recognized connexion with pathology. This state of affairs is changing. About twenty years ago it was pointed out by C. M. van Allen and also by P. N. Coryllos that, when a bronchus is obstructed, pulmonary deflation occurs only when the entry of air to an entire lobe is prevented in this way: if the obstruction affects only part of a lobe no deflation occurs, so that the air must have some collateral route by which to enter the obstructed part of the lung. In 1931 van Allen with T. Jung[2] described an experiment in which a catheter was introduced into the lower-lobe bronchus of a dog just past the first bifurcation. The free end of the catheter was kept under water. At every inspiration, water was sucked about five centimetres into the catheter: at every expiration air bubbled out. If, however, the catheter was introduced so that the bronchus was obstructed above the first bifurcation, air escaped from the immersed end on the first expiration but not again. This experiment indicated that there are collateral channels of ventilation within the pulmonary lobe, through which air may pass freely from one lobule to another. What could be the nature of these channels?

The existence of pores, stomata or vents (the word "pores" is the most suitable to describe them), between adjoining alveoli, has been known for nearly a hundred years, though there has been a good deal of debate whether they exist in the natural state or are artefacts of the histologist. Even after the demonstrations of van Allen and his collaborators the notion prevailed that collateral ventilation was a mechanism which functioned only in emergency; whether the alveolar pores remained open all the time or whether they were torn open only under the stress of bronchial occlusion still remained to be investigated. This matter was settled by P. T. Baarsma and M. N. J. Dirken, of the University of Groningen, who showed in animal experiments that the volume of air drawn into the obstructed lung by the collateral channels was always directly proportional to the negative pressure in the chest and that the communications functioned even at the most minute differences of pressure.[1] They concluded that the width of the communications rendering collateral gas transport possible was independent of the difference in pressure between the two parts of the pulmonary lobe and that it was proper to assume that they remained open under normal respiratory conditions. Thus was guaranteed a balance of pressure in the various parts of a pulmonary lobe and thus was promoted a uniform constitution of the content of the lung.

Baarsma and Dirken, with the collaboration of E. Huizinga, in a subsequent communication, demonstrated that collateral ventilation within the pulmonary lobe occurs in man.[1] They also postulated that pulmonary inflammation (they might have added œdema) and shallow respiration may prevent collateral ventilation from taking place. These experiments must convey at once to every physician the explanation of many commonplace observations in clinical practice as well as confirming the suppositions of those acute observers such as Coryllos, to which we have alluded.

The subject has been taken up anew by E. D. Churchill in his recent presidential address to the American Association for Thoracic Surgery on the "Segmental and Lobular Physiology and Pathology of the Lung".[2] Strangely enough, he makes no reference to the recent Dutch investigations which have served to focus attention on collateral ventilation; but he has reproduced some most interesting plates illustrating a thesis on bronchial occlusion by A. C. Reynaud, published in Paris in 1835, and showing lungs fully inflated notwithstanding complete fibrous stenosis of some of the smaller bronchi. Churchill points out that the mechanism of collateral ventilation is often frustrated in occlusions of the segmental bronchi, because at this level the epithelium is provided with secretory glands, the secretions from which soon drown the alveoli. On the other hand, when there is failure of aeration of part of a pulmonary lobe by the normal channel because of intense bronchiolar spasm or swelling, the collateral ventilation may prevent a too great tension developing in the alveoli. He suggests that the irritant non-productive cough that attends the onset of pneumonia or asthma may be a protective mechanism, building up the alveolar air tension to support the capillary walls by external pressure, while the collateral ventilation enables a slow reduction in this tension to take place so that no dangerous tension, which might rupture the alveoli, is built up. This suggestion is perhaps a little fanciful in view of the demonstration by Baarsma and his collaborators of the very free circulation of air through the collateral channels. A very much more impressive conception

[1] *The Journal of the American Medical Association*, June 11, 1949.
[2] *The Journal of Thoracic Surgery*, October, 1931.

[1] *The Journal of Thoracic Surgery*, April, 1948.
[2] *Ibidem*, June, 1949.

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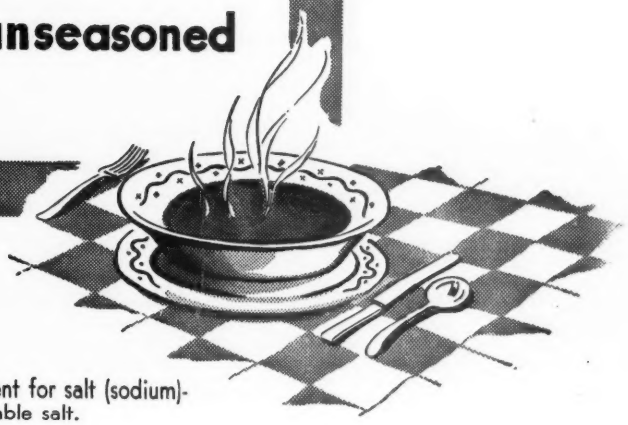

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advanced by Churchill is that the collateral ventilatory mechanism provides a means for the lung which has suffered bronchiolar damage (an event of common occurrence) to avoid lobular deflation and thus to avoid complementary emphysema and consequent reduction of functional efficiency of its remaining undiseased portions. This conception is supported by illustrations of some beautiful X-ray preparations by R. Klopstock of portions of lungs removed for bronchiectasis.

There has been a considerable latent period between the discovery of the alveolar pores (Thomas Addison described them in 1843) and the appreciation by physicians and surgeons of the important part they may play when the lungs are injured or diseased. It is certain that they are now capturing the medical imagination and that they will receive more consideration in the future.

IMMOBILIZATION AND THE OSCILLATING BED.

In a leading article on bed rest last year[1] we made reference to an investigation by J. E. Deitrick, G. D. Whedon and E. Shorr into the effects of immobilization upon normal men. The investigation had shown that certain ill effects resulted from prolonged immobilization, but Deitrick and his colleagues reached the firm conclusion that such effects were to be anticipated only in very ill patients or in those who were immobilized because of trauma, surgical procedures, poliomyelitis and similar disease conditions; there seemed to be little danger to the average patient from unrestricted bed rest for at least the first two or three weeks. Mention was made of the more serious effects noted by another investigator in healthy young males who had sustained fractures, and Deitrick and his colleagues pointed out that if even normal subjects were immobilized for long enough, a threat of urinary stone formation, impaired response of the circulation to the assumption of the upright position, derangement in creatine metabolism and accompanying loss of muscle mass and strength might become matters of real concern. A further communication has now appeared by Whedon, Deitrick and Shorr,[2] which forms a corollary to the earlier paper. The investigation reported in the recent paper was primarily concerned with the development of procedures (designed to combat the evils of inactivity) which could be instituted without delay and which would be applicable in conditions necessitating prolonged immobilization, for which convalescent training methods were unsuitable. Among the methods considered were calisthenic exercises, massage and passive exercise; but these were quite unsuitable for the specific conditions of the experiment, which required that the lower half of the subjects' bodies be encased in plaster, as in the previous study, which was to serve as the base-line for the evaluation of the treatment adopted. The extent of the circulatory derangements observed during immobilization in the previous study suggested the use of the oscillating bed devised by C. E. Sanders in 1936[3] for the treatment of patients with myocardial and peripheral vascular failure. It was thought that this bed, which rocks slowly back and forth, raising and lowering the feet with each oscillation, might exert favourable effects upon the circulation and possibly upon metabolic functions. Three normal healthy young men, all of whom had taken part in the previous investigation, were studied before, during and after a five-week period of immobilization in plaster casts; during this period they were treated in oscillating beds and their dietary intake was constant. Extensive investigation was made of the metabolic and physiological state of each subject. We cannot attempt even to summarize here the mass of data to be found in the paper of Whedon *et alii*, but their findings suggest that the oscillating bed may in considerable measure prevent many of the deleterious effects consequent upon prolonged immobilization. Beneficial effects are exerted on the mechanism responsible for circulatory control when the patient is in the erect position, on the changes in muscle mass and strength, and on creatine, nitrogen, calcium and phosphorus metabolism; as a result of the metabolic effects the likelihood of calculus formation in the urinary tract should be reduced. It is claimed that the oscillating bed is a simple and practical device, readily available, generally comfortable and capable of saving considerable nursing and physiotherapeutic care. Whether the favourable effects observed experimentally in immobilized but otherwise healthy subjects will have a parallel in diseased patients can be ascertained only by further investigation, but the findings suggest that the oscillating bed may be a valuable adjunct to the management of patients immobilized for long periods. It is the type of suggestion that will not appeal to those who are not "gadget-minded", and the making of advance claims would be most unwise. Further investigation is, however, by all means indicated.

[1] THE MEDICAL JOURNAL OF AUSTRALIA, September 4, 1948.
[2] *The American Journal of Medicine*, June, 1949.
[3] *The Journal of the American Medical Association*, March 14, 1936.

THE PRESENT POSITION OF SCARLET FEVER.

The general use of bacteriostatic and antibiotic drugs during the past ten years has altered the practice of medicine in almost every acute bacterial infection, and particularly is this the case in scarlet fever. The decline in mortality of the disease had begun long before any specific method of treatment was available, and also there was in different outbreaks considerable variation of the severity of the two most dangerous characteristics—the ability to spread, and the incidence of complications. The classical work of the Dicks in New York on these aspects led to the recognition of the erythrogenic toxin, and the varying susceptibility of the individual to its action, and finally to the discovery that it is possible to stimulate the production of antibodies against that toxin and so to give protection against clinical scarlet fever. With the advent of the sulphonamides and penicillin, the disease, already robbed of much of its terror as a killer, retreated still further from its eminence in relation to the production of complications, so that a review by C. P. Rhoads in relation to immunization and treatment is well worth consideration.[1] In the series called "Progress in Pediatrics", he quotes figures on the case incidence of scarlet fever amongst adequately treated "Dick-positive" nurses in fever hospitals, which afford reliable proof that the technique described by Dick does give protection against the disease. Five doses of the toxin are given, the dose being increased from 650 to 120,000 skin test units. Modifications of this method appear to produce less consistent results, and are not recommended. Reactions of various types do occur, but are less marked in children than in adults. It is pointed out that the invasiveness of the scarlet fever streptococcus as well as its erythrogenic toxin production are both important factors in the clinical syndrome, and that the immunity produced by the Dick method gives protection against both of these factors. In the review of treatment, it is observed that penicillin is of great use in the early stages of the disease, and in full doses cuts down the complication rate. In a proportion of cases a return of the carrier state is shown during convalescence, and a further dosage of 0·5 to 1·0 mega unit may be required. Sulphonamides are of little help in the early stages of the disease, but some physicians prefer them for the treatment of complications such as cervical adenitis and *otitis media*, which often resolve without suppuration. Convalescent serum and commercial antitoxin are effective therapeutic agents only if given early and in full dosages, and when combined with penicillin provide the best means of treatment.

In New South Wales, authorities in charge of fever hospitals have been investigating the length of the infectious stage and the likelihood of shortening the isolation period. It may well be that scarlet fever patients will require shorter and shorter time in institutions, and that the disease may even cease to be notifiable and become one which can be treated at home under proper supervision and with bacteriological tests to prevent the missing of the carrier state.

[1] *American Journal of Diseases of Children*, February, 1949.

Abstracts from Medical Literature.

PHYSIOLOGY.

Effects of Cold on Infant Rats.

J. FAIRFIELD (*The American Journal of Physiology*, December, 1948) reports that newborn white rats, aged from 0 to 17 days, were cooled to 2°, 5°, 10° or 20° C. in a respirometer filled with oxygen and immersed in a water bath. The immediate fall in the intraperitoneal temperature of the rats indicated that the rats were too immature to maintain body temperatures above environmental temperatures. At all temperatures below and including 10° C., the exposures were too severe to elicit any but a transient increase in metabolism (as shown by oxygen consumption), and these transient and comparatively feeble protections against cold were manifested only in rats over three days old. Ultimately, in all experiments on rats up to ten days old at 3° C. or less, the metabolic rate reached zero and remained so for as long as one hundred and eight minutes, complete recovery of the animal then following. Electrocardiograms showed that the rate of the heart beat and of the conduction of the cardiac impulse decreased linearly with the decrease in body temperature, the heart beat disappearing when the body temperature reached between 9° and 3·5° C. The asystole lasted up to eighty-two minutes, being followed by complete recovery of the animal and its acceptance by the mother rat. It was believed that the prognosis for non-survival of the four rats which died (out of 41 exposed) was the finding of 2:1 or 3:1 block with irregular *QRS* impulses, suggesting serious injury to the atrio-ventricular node and conduction system which apparently was irreversible. This lethal effect was manifested only in animals whose body temperatures were 7° C. or under, and the anoxia during the rewarming period may have been the ultimate factor in survival or non-survival. These low lethal temperatures classify the newborn rat as a temporary poikilotherm.

Effects of Cooling on Nerve Conduction.

P. O. CHATFIELD, A. F. BATTISA, C. P. LYMAN AND J. P. GARCIA (*The American Journal of Physiology*, November, 1948) report that whilst the golden hamster (*Mesocricetus auratus*) hibernates when exposed to cold, the rat does not. The behaviour of tibial nerves from these two species was studied during cooling to determine whether the effects on the height of the action potential, conduction velocity, excitability and refractory periods would demonstrate species differences in the resistance of nerve to cold. Nerves from hamsters did not cease functioning until an average temperature of 3·4° C. was reached, while nerves from rats ceased functioning at an average temperature of 9° C. When nerves from rats were cooled, the action potential, conduction velocity and excitability decreased linearly with the temperature. When nerves from hamsters were cooled similarly these variables decreased at a slower rate. The action potentials increased in amplitude in the early stages of cooling and then declined. Cooling increased the duration of the absolutely and relatively refractory periods of nerves from both animals, although relatively less so in the hamster than in the rat. Tibial nerves of hamsters, though capable of functioning at low temperatures, fatigued rapidly at such temperatures. The critical temperature at which peripheral nerve of the hamster ceases to function is at a level just below that at which hibernating hamsters have been found to maintain their body temperatures by metabolic means when exposed to extreme cold. The results reported are regarded as evidence of an intrinsic adaptation to cold possessed by a species capable of hibernation.

The Respiratory Dead Space.

W. S. FOWLER (*The American Journal of Physiology*, September, 1948) describes a method of determination of respiratory dead space, based upon the continuous and simultaneous measurement of the expired gas volume flow and of the nitrogen content of the expired gas after the change from breathing air to breathing 99·6% of oxygen. In normal subjects the effect of non-uniform alveolar gas on dead-space measurements can be largely eliminated. The average volume of the physiological dead space in 45 healthy males at rest was 156 millilitres; the average expired volume required to wash out the dead space was 325 millilitres. The physiological dead space/tidal volume fraction averaged 25·9%, but varied widely in different individuals. The volume of the physiological dead space is affected by two factors. The first is the anatomical volume of the bronchial tree. Maximal variations of inspiratory lung volume changed the dead space by about 100 millilitres. Voluntary hyperventilation and post-exercise hyperpnœa increased physiological dead space equally; the increase was 100 millilitres or less. The second factor is gas diffusion between terminal bronchioles and alveolar spaces. Prolongation of inspiratory time by two to three seconds significantly reduced the volume of the physiological dead space, and breath-holding, during inspiration (twenty seconds), caused reductions of 44 to 82 millilitres. With slow, deep breathing the anatomical volume increase is counteracted by diffusion occurring during the prolonged inspiratory time. Variations in the rate of inspiratory volume flow did not affect the volume of the physiological dead space. Clinical applications of the method are suggested.

Sudden Vasoconstriction in Denervated or Sympathectomized Paws Exposed to Cold.

J. F. PERKINS, M. C. LI, F. HOFFMAN AND E. HOFFMANN (*The American Journal of Physiology*, November, 1948) state that whilst the skin of the extremities in a normal animal becomes cool owing to reflex vasoconstriction, a sympathectomized or denervated extremity tends to remain warm because the vasoconstrictor pathways have been interrupted. They report that such vasodilatation does not persist indefinitely. A sudden, late fall of skin temperature was observed when denervated or sympathectomized paws of one unanæsthetized dog and sixteen lightly anæsthetized cats were exposed to cold for prolonged periods. A corresponding abrupt rise of skin temperature was observed when the chilled extremities were exposed again to warm air. Analysis of the curves of skin temperature indicated that the vasoconstriction producing this sudden fall in skin temperature was great enough to reduce blood flow to approximately one-tenth of its previous value. The vasoconstriction appeared when the skin of the operated paws reached a "critical temperature". After preganglionic lumbar sympathectomy in the dog, this "critical temperature" remained constant at approximately 22° ± 2° C. up to one hundred and thirty days after operation. After section of the sciatic nerve in cats, the "critical temperature" ranged between 19° and 26° C. up to two days after operation and then rose to reach between 28° and 31° C. by the end of four to twenty-one days after operation. This effect of prolonged cooling appears to be due chiefly to locally increased sensitivity of the denervated blood vesels to cold, because the reaction appeared at the usual "critical temperature" (*a*) when the adrenal glands were extirpated or inactive, (*b*) when the leg was disconnected from the body except for the procainized artery and vein, and (*c*) when only the paws were chilled while the animal's body was kept warm enough to produce maximal vasodilatation in the normally innervated paws.

Artificial Respiration and High Altitudes.

F. R. BLOOD AND F. E. D'AMOUR (*The American Journal of Physiology*, January, 1949) report that at both high and low altitudes the mechanical methods for artificial respiration were superior to manual methods in the resuscitation of the rat; this is in line with the studies of Steinberg and Dietz and those of Swann on dogs. The Schäfer method was more effective at high altitudes than the Eve method; Cordier and Comroe and Dripps found the opposite of this in their studies on humans. Further, the Schäfer method was 40% efficient at high altitudes, but none of the animals studied could be resuscitated at low altitudes. This suggests a greater recoil of the thorax and diaphragm at high altitudes than at low, which proves effective in the Schäfer method, but apparently offers no help with the Eve method. The administration of oxygen while artificial respiration is given at high altitudes proves especially beneficial to the circulation. This was particularly true with the barospirator, which was the most effective method studied for restoration of the circulation. Since the circulatory response always occurred first, this undoubtedly was important in bringing about the resumption of respiration. A low environmental temperature facilitates resuscitation at high altitudes. It is evident from the results with the Drinker respirator that temperature had a greater effect than the administration of oxygen-carbon dioxide mixtures. None of the animals recovered with oxygen at the higher temperatures (34° to 35° C.), but 45% of the animals studied at low temperatures (15° to 20° C.) recovered completely with only air. "Coramine" proved effective in stimulating respiration at low altitudes, but not at high. Other stimulants studied at low altitudes were caffeine, strychnine, picrotoxin, "Metrazol" and potassium cyanide. Of these only

strychnine approached "Coramine" in effectiveness. Rats were maintained for about twenty-five minutes by diffusion respiration, pure oxygen being used as the diffusion gas. Helium-oxygen mixtures offered no advantage over pure oxygen, but in fact decreased the survival time of the animals.

BIOCHEMISTRY.

Biosynthesis of Protoporphyrin.

J. WITTENBERG AND D. SHEMIN (*The Journal of Biological Chemistry*, March, 1949) administered glycine labelled with N^{15} to ducks and to a human, and isolated hæmin from the red cells. The labelled hæmin was degraded in order to study the isotope concentrations of the nitrogen atoms in the pyrrole structures of the porphyrin. The hæmin was converted to hæmatoporphyrin dimethyl ether, which was then oxidized to yield methylmethoxyethylmaleimide (derived from the methylvinylpyrroles of the porphyrin) and hæmatinic acid (derived from the methyl propionic acid pyrroles of the porphyrin). The N^{15} concentrations were found to be equal in the porphyrin, in the methylmethoxyethylmaleimide, and in the hæmatinic acid. These data demonstrate that glycine is the precursor for both types of pyrroles in the protoporphyrin molecule.

Urea Formation in Liver.

F. BERNHEIM AND M. L. C. BERNHEIM (*The Journal of Biological Chemistry*, April, 1949) report that the addition of ornithine to liver slices from rats fasted for twenty-four hours increases the urea production from ammonium sulphate, but has little effect on that from l-alanine or l-glutamine. Certain amino acids, particularly glycine, inhibit urea production from ammonium sulphate. This inhibition can be overcome by adding ornithine but not magnesium salts. Glycine has no effect on urea production from alanine or glutamine. In these respects the caffeine inhibition resembles the glycine inhibition. In low concentrations 2,4 dinitrophenol inhibits urea production from ammonium sulphate, but has much less effect on that from alanine and no effect on that from glutamine. The inhibition occurs in the presence of ornithine, but can be partially overcome by the addition of pyruvate, this probably enabling the ammonia to be synthesized to alanine, which then acts as a source of urea. The conclusion is drawn that the mechanism of the addition of ammonia to ornithine differs when inorganic and organic nitrogen sources are used.

Excretion of S^{35}.

D. D. DZIEWIATKOWSKI (*The Journal of Biological Chemistry*, March, 1949) reports that the excretion by rats in urine and fæces of S^{35}, given in the form of sodium sulphate, appears to be rapid. Excretion by these routes accounts for the major portion of the S^{35} given. By the end of the one hundred and twentieth hour approximately 95% was found to have been eliminated. In the period of one hundred and twenty hours the concentration of S^{35} in the blood, liver and brain was found to have fallen to relatively low levels. A similar concentration of S^{35} in the blood and liver was attained by the forty-eighth hour and in the blood and brain by the seventy-second hour. In contrast to the rapid fall observed in the liver and blood, the concentration of S^{35} was found to increase until about the eighth hour in bone and until about the twenty-fourth hour in bone marrow. The subsequent fall in the S^{35} concentration of the bone and bone marrow was also slower than that in blood, liver and brain.

Effect of Pyridoxine on Blood Urea Level.

W. J. MCGANITY *et alii* (*The Journal of Biological Chemistry*, March, 1949) report that, in confirmation of the work of others, the fasting blood urea level was significantly less in normal pregnant than in non-pregnant subjects. The urea level was definitely lower in cases of *hyperemesis gravidarum* than in normal pregnancy, but was restored to a typical normal value after the administration of pyridoxine. Changes in blood urea level after a test load of alanine were similar in normal pregnancy to those observed in non-pregnant persons, whereas subjects with *hyperemesis gravidarum* showed an abnormal response which was corrected after pyridoxine was given.

Pteroylglutamic Acid and Glycerin.

J. R. TOTTER *et alii* (*The Journal of Biological Chemistry*, April, 1949) report that pteroylglutamic acid ("PGA") was found to increase significantly the fæcal and probably the urinary porphyrin excretion of rats fed a purified diet. "PGA" largely reversed the growth inhibition and reduction in porphyrin excretion caused by feeding a 3% sodium benzoate preparation to rats maintained on a purified diet. Glycine at a 2% level not only wholly prevented the reduction in porphyrin excretion caused by sodium benzoate, but significantly increased the porphyrin excretion above that of control animals receiving neither sodium benzoate nor "PGA". Sodium benzoate fed at a 3% level reduced by about one-fourth the fæcal dry weight of rats fed a purified diet with or without added "PGA". The reduction in fæcal weight was prevented by the addition of 2% of glycine to the diet. Rats fed 3% of sodium benzoate in a purified diet not containing "PGA" had average white blood cell counts significantly lower than those of animals receiving a similar diet containing "PGA". The addition of 2% of glycine did not raise the white blood cell count of rats receiving a diet containing sodium benzoate in the absence of dietary "PGA", although it greatly increased the growth rate. Sodium benzoate at a 3% level in purified diets reduced the fæcal "PGA" excretion when calculated either per day or per gramme of dried fæces.

Insulin in Amino Acid Metabolism.

W. D. LOTSPEICH (*The Journal of Biological Chemistry*, May, 1949) has studied, in the normal fasted dog, the effect of insulin on the blood concentration of the ten essential amino acids. He has shown that there is a correlation between the proportions of each amino acid removed from blood after insulin administration and the proportions of each amino acid in a representative body protein, skeletal muscle. He suggests on the basis of this observation that insulin promotes the synthesis of protein from circulating amino acids. This interpretation of the data is in keeping with recent evidence that points to an intimate relationship between insulin and the anterior pituitary gland in both protein and carbohydrate metabolism.

Hæmosynthesis and Red Cell Dynamics.

I. M. LONDON *et alii* (*The Journal of Biological Chemistry*, May, 1949) have found the average life span of the circulating red blood cell in a normal human adult male to be about one hundred and twenty days, and in a normal human adult female one hundred and nine days. A subject with *polycythæmia vera* was shown to have a normal red cell life span of one hundred and thirty-one days and a normal pattern of red cell destruction, but a rate of red cell and hæmoglobin production about two and a half times the normal. The mechanism of the development of *polycythæmia vera* is discussed in the light of these findings. In sickle-cell anæmia the red blood cells were shown to be destroyed indiscriminately rather than as a function of their age. Their mean survival time in the subject studied was forty-two days, their half-time twenty-nine days. The rates of hæmoglobin and red cell formation and destruction were about 2·8 times the rates in normal man. Study of a subject with untreated pernicious anæmia disclosed an abnormal pattern of red cell destruction and a mean survival time of approximately eighty-five days. The rate of production of circulating red-cell hæmoglobin was found to be about four-fifths of the normal, the rate of production of circulating red cells about half the normal rate. Treatment with liver extract resulted in restoration of the pattern of red-cell destruction to normal and in a normal red-cell life span of one hundred and twenty-nine days. The utilization of dietary glycine for the synthesis of the protoporphyrin of hæmoglobin is very rapid, and cells containing labelled hæmoglobin are released into the circulation within several hours after the start of feeding labelled glycine. The time relationships between hæmoglobin deposition in the red cell and release of the red cell into circulation are discussed.

MEDICINE.

Intravascular Hæmolysis and Potassium Intoxication.

J. WENER *et alii* (*American Heart Journal*, May, 1949) have shown that in rabbits, rapid intravascular hæmolysis, by liberation of the corpuscular potassium into the plasma, can cause death from potassium intoxication. They suggest that in certain acute hæmolytic diseases, such as the reaction to incompatible transfusion and *erythroblastosis fœtalis*, potassium intoxication may occur.

Acute Rheumatic Fever in the Elderly.

D. H. APPELMAN *et alii* (*American Heart Journal*, May, 1949) report a case of acute rheumatic fever, occurring for the first time, in a patient aged sixty-five years. The patient was treated with sodium salicylate and made a good recovery.

Special Article.

EXPERIENCE OF MEDICAL GROUP PRACTICE.

We have had inquiries from time to time from various medical sources about the working arrangements which exist in our group practice, and in particular about its initial formation. This article hopes to give all relevant information.

In 1938, one of us approached five of his neighbours in practice and suggested that we all amalgamate. Three suburban practices were involved, one a three-man practice, one a two-man practice and one that of a single man. They served the same district, and all the doctors concerned were friendly competitors.

The idea was reinforced with the arguments that cooperation was more desirable than competition, that we could be more helpful to one another, that overhead expenses would be reduced and that a common financial pool would enable us to purchase equipment and plant which would be out of proportion in the ordinary practice. Agreement on these principles was quickly followed by a wide exploration of the whole field, and it became apparent to all that two things were essential if our plans were to succeed: first, that business management be secured from outside sources, and secondly, that a contract should cover every possible phase of our activities. We therefore decided to place the financial management in the hands of an accountant, whose experience had been enriched by active participation in hospital management, lodge affairs and familiarity with the business aspects of medical practices.

The rough draft of the contract, which was framed during our discussion over a period of twelve months, was then presented to our legal advisers for final preparation as a working agreement between members.

The details of the agreement cover duration of partnership, objects (to practise, to purchase or lease property, to carry on ancillary business), style of partnership, area of practice, surgeries and consulting rooms, capital, purchase of instruments *et cetera*, shares in capital, separate property and records of patients prior to beginning of partnership, motor-cars and running expenses *et cetera*, bankers, payment inward of moneys, record of moneys received by partners, disbursements, income of partnership, reserve fund, division of profits, allowance to partners who maintain separate surgeries, expenses and outgoings, discontinuance of practice at separate rooms, duties of partners, acts forbidden, books of account and records, holidays, disability or absence of partner, absence on war service, non-determination of partnership, retirement, expulsion, retirement on request, consequences of retirement, non-competition, dissolution, arbitration, meetings and notices.

It was decided to build a suite of rooms consisting of office, waiting room, X-ray room, laboratory, physiotherapy room and two consulting rooms. Each partner would continue to work his practice exactly as he had previously, using his own consulting rooms. He could use the clinic rooms if he wished, in addition to or in substitution for part of his usual consulting hours. The rooms were at first used when assistance was wanted, for example, for minor operations, treatment of fractures, consultation *et cetera*, but greatly increased use has been made of them since then, and we have resolved on, and put in hand, extensions which will increase accommodation by four more consulting rooms, plaster room, sterilizing room, receptionist's office and greater office space.

It was agreed that the total gross income of the several practices, when grouped, would be divided amongst members in proportion to the amount of the average of their earnings for the two years prior to date of commencement, and shares ranged from 22% down to 10%. It was further agreed that when the income increased beyond the total gross figure the income was to be shared equally. Expenses are first deducted from receipts before any payments are made to members. Each man pays his own travelling expenses, telephone accounts, surgery light and power. All other expenses, such as book-keeping, stationery, stamps, exchange and collection expenses, are borne by the partnership. An allowance for upkeep and attendance is made to those members who maintain surgeries at their homes, in our case to four members.

Our accountant supplies a staff to attend to all the financial recording work.

The office staff consists of two female clerks. The nursing and technical staff consists of two trained nurses and one receptionist on full time, and a part-time pathology technician working every afternoon. One nurse takes our X-ray films, which are afterwards reported on by a qualified radiologist, who is on a yearly retainer.

The nurses keep a day-sheet, on which is recorded all work they do and the fee charged. They also attend to innumerable small details which do not require the personal attention of one of us. They give immunizing and therapeutic injections, renew dressings, receive messages, arrange appointments, and arrange for visits. A diary of operations is kept and teams for operations are arranged; for emergency calls they can always find one of us at any time of the day. In this way the minor work of the practice is attended to promptly and efficiently, the men being left free to attend to more important work. If necessary the technician calls at the bedside in homes or in hospital to collect her pathological material.

Members are supplied with special day-sheets, on which are recorded patients' names, addresses, nature of services (consultation, visit, operation or confinement *et cetera*), and the fee charged. All moneys received are also entered on this sheet. If the member wishes, he may keep these payments and pay them into his own bank account. In that case the corresponding amount is deducted from the monthly cheque which he receives from the group. The day-sheets are handed in to the office staff at regular intervals, and the latter then assume all responsibility for the account. Accounts are rendered monthly in most cases, and we regard three months' credit as a reasonable period. Each month we meet our accountant, who produces a comprehensive financial statement, and we learn of our share of the amount set aside for distribution. Our bills are inspected and certified before being passed for payment. Other business attended to at these meetings is the revision of doubtful and queried accounts, institution of new methods of treatment, and a check on fluctuating costs of drugs, dressings *et cetera*.

Holiday leave amounts to four weeks annually and is taken by most members in two periods. This leave is not cumulative, as it is regarded as essential that we should avoid becoming stale. The absent member's work is done by the other partners, and in this regard staggered hours for consultation are most desirable. No "locum" fees are charged the one on leave.

If sick leave is necessary in addition to annual leave, the other partners do the sick man's work or instal a *locum tenens* if they think necessary. The sick one bears the cost of this assistance after seventy-two hours' absence. For longer absence a member receives half of the average of his share for the previous six months, the balance being retained to meet cost of relief, and any balance is then divided between the other members.

In the event of death of a partner, his practice is taken over and kept going, and his executors are paid the full goodwill value, together with his share of the book debts and subscribed capital. Thus his estate is protected from loss. His share which then reverts to the group is available for sale to a new partner.

The capital of the group was formed in the following way. During the period of the discussions relative to the establishment of the clinic, which lasted some twelve months or so, each member paid into a fund £10 per month. In addition to that, his working plant in the shape of X-ray machines, diathermy machines, instruments and other equipment was taken over at valuation. At this date each member's capital account stands at £500.

Finance for the actual building was easily forthcoming from our bankers. Building expenses are, of course, higher now than when we built, but not so high as to prohibit the launching of similar schemes elsewhere. It would not interfere with Australia's housing problem if suitable small factory or shop premises were taken over and converted.

Since the inception of the group, one member has retired from general practice, and from the group, and another member has reduced his activities to morning duties only, with freedom from week-end duty and evening consultations. The whole interest of the former was acquired by the group, including his share of the book debts, at a valuation made by our accountant. This share was then sold to two junior members recently discharged after army service, each purchasing a share of goodwill, capital and book debts. We were in a position to arrange the terms of purchase over an extended period, and no heavy initial payment was required such as would be the case in the transfer of a single-man practice. The share in the group of the senior, partly retired partner was, excepting a small interest, purchased from him, and the portion so acquired was recently sold to another new partner. Thus at this date our original six members have increased to eight.

A specialist practice can easily be incorporated with a general group practice, and two of our members so specialize.

Objections which we have heard to group practice are as follows:

1. That patients would object to being attended by any but their own regular attendant. This has not been our experience; patients are attended exactly as if each member was conducting his own practice. If urgent calls are received at a member's house, and he is not available, one of the other partners is available as a substitute. The members are known as partners, and patients expect to see the duty man at week-ends and on other non-routine visits. For a short time we experienced a little chopping and changing of patients, but generally patients retain the services of the same member.

2. That some members do more work than others. This is to some extent true and is unavoidable. It is so with all partnerships whether large or small. In our case the amount of work varies with the type of practice. Some have large lodge lists with few private patients. Others do mostly private work with a small lodge list. One partner does no surgery at all, one does all the major surgery, one does eye, ear, nose and throat work only. There is no rigid measurement of how much each man actually earns for the group, nor to us does there appear to be any such need. Pressure of work may require one partner to request the nurses temporarily to transfer all new visits to one of the other partners, and this system has worked satisfactorily.

3. That our overhead expenses are high. In our experience the converse is the case.

4. That disagreement between members is liable. We have had disagreements, all of a minor nature, but a majority vote decides all controversial subjects, and each realizes that it is to his interest to keep the group as a vital active show. Up to date all subjects requiring guidance have turned out to be provided for in our agreement.

Summary.

Group working gives greater facilities for the personal investigation of the patient, and develops friendship and cooperation between members. It also leads to a free interchange of ideas and information, and an increase of knowledge. There is an economy of working expenses, as well as relief from book-keeping and work in connexion with the collection of fees. This allows more time for leisure and study. It lends to development of a degree of special knowledge by individual members in certain branches of work. A roster system of duties relieves the strain of week-end and holiday work, and provides staggered hours for consulting from 9 a.m. to 6 p.m. Technicians under supervision do much of the routine work, thus freeing members for the most important work. When a number of men are working in a group, very little difficulty is experienced in arranging vacations and special leave for post-graduate studies, and in covering absence due to sickness.

In group practice it becomes possible to acquire quite a wealth of equipment, which would make a single practice or a small partnership over-capitalized. The availability of a good stock of medicaments at a central depot saves time and worry, and meets many an emergency.

Group practice provides for its members greater financial stability, and new members in any established group are sure of their income from the date of admission. In the event of a retirement or death, the remaining partners, in assuming the responsibility for the share of the retiring or deceased member, thereby protect his interests. These members are also protected in the fact that they have the right to deal with such share, either by division or by the introduction of a new member of their own choice.

When a member by reason of old age or ill health is unable to give a full-time service, he can, by selling a portion of his share, limit his activities.

Among the essentials for instituting a group practice is a spirit of amity, cooperation and mutual trust; without these no scheme could progress. The union of individual or partnership practices into a group means that in time the identity of any particular practice is largely submerged.

A comprehensive agreement must be entered into by the contracting parties, and management must be on formal lines, all business being conducted at regular meetings of members, of which proper records should be kept.

A group could consist of general practitioners only, each practising at his own home. However, it is advantageous to have a central building providing general consulting rooms and offices for the technicians and clerical staff. As a group expands, it is desirable that it should include amongst its members men with qualifications for specialized work.

The writer commenced the study of medicine nearly fifty years ago, and has been engaged in almost every form of general practice: for two years as an interne; in a one-man country town; in a two-man town in opposition; in a larger town in partnership; in suburban practice single-handed, with an assistant, and with a partner; and finally, for the past nine years, as a member of a group practice. It cannot be too forcefully stated that one would never wish to return to any of the other forms of practice. This, I am assured, is the opinion of every member of our group.

R. G. BURNARD, M.B., B.S., M.R.C.P.

Torrensville,
South Australia.

Correspondence.

STREPTOMYCIN AND TUBERCULOSIS.

SIR: I wish to heartily endorse the rational views on the use of streptomycin put forward by Dr. R. Munro Ford in his letter in THE MEDICAL JOURNAL OF AUSTRALIA of August 20, 1949.

In our experience streptomycin has been instrumental in overcoming the acute incidents that are so common in cases of pulmonary tuberculosis much more safely and effectively than any other means at our command. It is not only desirable, it is our duty, to do everything we can to help our patients over these acute exacerbations. It seems illogical to let our patients rapidly deteriorate in their condition and perhaps die for the sole reason that they may later need a surgical operation with streptomycin to "cover" its attendant risks.

As Dr. Ford has said, it usually needs only a short course of treatment, perhaps not more than 15 grammes spread over thirty days, to control these acute incidents. The risk of streptomycin resistance in these circumstances is negligible, and I feel that there is an undue fear in the minds of many physicians and surgeons in this regard. No one surely would expect streptomycin to repair lungs that are irreparably damaged, but if it gives patients no more than temporary relief it should not be withheld.

Yours, etc.,
D. R. W. COWAN.

163 North Terrace,
Adelaide,
September 6, 1949.

DUODENAL ULCER.

SIR: In the journal of January 6, 1945, a letter appeared, signed by A. L. J. Peters, of Belgrave, Victoria, in which he described the dramatically successful result which followed the treatment of a patient suffering from duodenal ulcer with a mixture containing "Metaphen". This is the treatment as described by Dr. Peters:

℞
"Metaphen 1:500 Sol." (Abbott) .... 2 fluid ounces
Glycerin ..... 1 fluid ounce
Aq. Cinnamon ..... ad 4 fluid ounces

Sig.: One and a half teaspoonfuls, increased next day to two teaspoonfuls, in half a tumbler of water, to be taken one and a half to two hours after each meal, three times a day.

Two teaspoonfuls to be taken three times a day for a week.

Second week: two teaspoonfuls night and morning.

Third week: two teaspoonfuls once a day.

Fourth week: two teaspoonfuls every other day, stopping the drug thereafter.

In addition, a five grain capsule of chloretone was given at bedtime to allay mental and nervous symptoms, and induce sleep, and one ounce of *Linctus Heroini* was prescribed, a teaspoonful to be given, if necessary, for pain. No special diet is mentioned as necessary.

I have used this treatment in four cases of radiologically confirmed peptic ulcer (one gastric, three duodenal, none with complications), adding a few simple dietary directions about the need for thorough mastication, avoiding condiments and irritating foods *et cetera*. In each case the relief obtained was prompt and striking: one patient left his bed within forty-eight hours, the others continued their daily work without intermission.

It would be interesting if this treatment could be tried out in a large series of cases, for example, in the out-patient department of a public hospital, and the results reported. If favourable, even in a proportion of cases, it would save using hospital beds. It is relatively cheap and simple, as compared with the standard routine of treatments for peptic ulcer.

In the "Physician's Index" (1940) "Metaphen" is described as a "mercury derivative of nitrocresol", and there is a brief reference to its use in the treatment of "peptic ulcer and colitis". How does it act, and does its action shed any further light on some aspects of the ætiology of peptic ulcer?

Yours, etc.,

ALEXA MACLEAN.

Bogan Gate,
New South Wales,
September 6, 1949.

A GIFT TO THE EMERGENCY FUND.

SIR: Herewith please find a cheque for £101 3s. 9d. This represents the balance of a fund subscribed in 1937-1938 to aid this local association in its campaign against the proposed national health insurance of those years. The fund included subscriptions from all parts of the Commonwealth. Since it was deemed impracticable to return this balance to the original donors, our last annual general meeting resolved unanimously to hand the money through you to the emergency fund to aid the campaign against the proposed national medical service. Would you be so good as to hand on the cheque accordingly and also to publish this letter to acquaint the donors of the action taken.

Yours, etc.,

J. P. LYTTLE, M.B., Secretary,
Central Southern Medical Association.

Goulburn,
New South Wales,
August 21, 1949.

[The cheque has been forwarded to the General Secretary of the Federal Council of the British Medical Association in Australia.—EDITOR.]

Congresses.

INTERNATIONAL CONGRESS OF PSYCHIATRY.

AN International Congress of Psychiatry will be held in Paris from October 4 to 12, 1950. The sections of congress will be those of general psychopathology, clinical psychiatry, cerebral anatomy, physiology and biology, biological therapy, psychotherapy, psychoanalysis and psychosomatic medicine, social psychiatry, and child psychiatry. Subjects already arranged for discussion include "The Psychopathology of Delusions", "The Application of Testing Methods to Clinical Psychiatry", "Cerebral Anatomy and Physiology in the Light of Lobotomies and Topectomies", "Indications of the Shock Therapy Methods", "The Evolution and Present Trends of Psychoanalysis" and "Genetics and Eugenics". There will be also an exhibition of psychopathological art and an exhibition on the history and progress of psychiatry. The general secretary of the congress is Dr. Henry Ey, 1, Rue Cabanis, Paris 14°, France.

Congress Notes.

AUSTRALASIAN MEDICAL CONGRESS (BRITISH MEDICAL ASSOCIATION).

THE Executive Committee of the Seventh Session of the Australasian Medical Congress (British Medical Association) to be held at Brisbane, Queensland, from May 27 to June 3, 1950, has forwarded the following information for publication.

Office-Bearers of Sections.

One or two alterations have been made since the list of presidents of sections was published in July, 1949. The list of office-bearers at present is as follows:

Section of Medicine.

President: Dr. J. P. Major (Victoria).
Vice-Presidents: Dr. O. Hirschfeld (Queensland), Dr. J. K. Maddox (New South Wales), Dr. K. S. Hetzel (South Australia), Dr. J. L. Grove (Tasmania), Dr. H. S. Lucraft (Western Australia).

Section of Surgery.

President: Dr. B. T. Edye (New South Wales).
Vice-Presidents: Dr. A. Lee (Queensland), Dr. A. E. Coates (Victoria), Dr. P. S. Messent (South Australia), Dr. A. O. Green (Tasmania), Dr. J. P. Ainsley (Western Australia).

Section of Naval, Military and Air Force Medicine and Surgery.

President: Surgeon Captain L. Lockwood (Victoria).
Vice-Presidents: Colonel A. M. McIntosh (New South Wales), Dr. J. M. Dwyer (South Australia), Colonel J. H. Stubbe (Western Australia), Colonel K. B. Fraser (Queensland), Dr. L. N. Gollan (Tasmania).

Section of Obstetrics and Gynæcology.

President: Dr. F. A. Maguire (New South Wales).
Vice-Presidents: Dr. W. K. McIntyre (Tasmania), Dr. R. F. Matters (South Australia), Dr. D. A. Quinlan (Western Australia), Dr. H. Furnell (Victoria), Dr. H. S. McLelland (Queensland).

Section of Pædiatrics.

President: Dr. R. Southby (Victoria).
Vice-Presidents: Dr. P. A. Earnshaw (Queensland), Dr. T. Y. Nelson (New South Wales), Dr. R. L. Thorold Grant (South Australia), Dr. J. P. Millar (Tasmania), Dr. R. H. Crisp (Western Australia).

Section of Ophthalmology.

President: Dr. N. M. Gregg, abroad (New South Wales).
Vice-Presidents: Dr. L. Mitchell (Victoria), Dr. T. L. McLarty (South Australia), Dr. J. L. R. Carter (Tasmania), Dr. W. Lockhart Gibson (Queensland), Dr. Claude Morlet (Western Australia).

Section of Oto-Rhino-Laryngology.

President: Dr. G. C. Halliday, abroad (New South Wales).
Vice-Presidents: Dr. Walter Crosse (Queensland), Dr. R. M. Glynn (South Australia), Dr. B. Hiller (Tasmania), Dr. L. W. Johnston (Victoria).

Section of Public Health, Tuberculosis and Tropical Medicine.

President: Dr. D. R. W. Cowan (South Australia).
Vice-Presidents: Professor A. H. Baldwin (New South Wales), Dr. G. Cole (Victoria), Dr. C. L. Park (Tasmania), Dr. C. E. A. Cook (Western Australia), Dr. A. Fryberg (Queensland).

Section of Anæsthesia.

President: Dr. A. D. Morgan (New South Wales).
Vice-Presidents: Dr. S. R. Hecker (South Australia), Dr. R. A. Lewis (Tasmania), Dr. J. H. Willson (Queensland), Dr. G. R. Troup (Western Australia), Dr. D. G. Renton (Victoria).

Section of Pathology, Bacteriology and Biochemistry.

President: Dr. R. Webster (Victoria).
Vice-Presidents: Dr. I. M. Mackerras (Queensland), Dr. Marjory Little (New South Wales), Dr. R. Y. Mathew (Tasmania), Professor J. S. Robertson (South Australia), Dr. B. C. Cohen (Western Australia).

Section of Orthopædics and Physical Medicine.

President: Dr. L. G. Teece (New South Wales).
Vice-Presidents: Dr. T. King (Victoria), Dr. N. S. Gunning (South Australia), Dr. D. W. L. Parker (Tasmania), Dr. G. A. C. Douglas (Queensland), Dr. R. D. McKellar Hall (Western Australia).

Section of Radiology and Radiotherapy.

President: Dr. J. S. Verco (South Australia).
Vice-Presidents: Dr. A. G. S. Cooper (Queensland), Dr. E. W. Frecker (New South Wales), Dr. J. O'Sullivan (Victoria), Dr. R. D. McIntosh (Tasmania).

Section of Dermatology.

President: Dr. J. C. Belisario (New South Wales).
Vice-Presidents: Dr. B. B. Barrack (Queensland), Dr. R. Brodie (Victoria), Dr. W. C. T. Upton (South Australia), Dr. G. R. Beattie (Tasmania), Dr. H. Macmillan (Western Australia).

Section of Neurology and Psychiatry.

President: Dr. H. Maudsley (Victoria).
Vice-Presidents: Dr. J. Bostock (Queensland), Dr. W. S. Dawson (New South Wales), Dr. S. B. Forgan (South Australia), Dr. W. J. Freeman (Tasmania), Dr. R. G. Williams (Western Australia).

Section of Medical Literature and History.

President: Dr. W. L. Crowther (Tasmania).
Vice-Presidents: Dr. H. Boyd Graham (Victoria), Dr. K. S. M. Brown (New South Wales), Dr. L. P. Winterbotham (Queensland).

Patron of Congress.

His Excellency Lieutenant-General Sir John Lavarack, K.B.E., C.B., C.M.G., D.S.O., Governor of Queensland, has accepted the invitation of the executive to become patron of the congress.

Public Lecture.

Sir John Medley, Vice-Chancellor of the University of Melbourne, who is to deliver the public lecture on Wednesday, May 31, 1950, has chosen as his subject: "Is Medicine a University Subject?"

Transport.

The Transport Committee hopes to arrange for some "Fairmile" cruising launches to be reserved for the use of congress members for tours of the Barrier Reef immediately before and after congress. For further details of these trips and transport to Brisbane prospective members should communicate with their honorary local secretaries, who are as follows: *New South Wales*, Dr. Selwyn G. Nelson, 233 Macquarie Street, Sydney; *Victoria*, Dr. Leonard H. Ball, 426 Albert Street, East Melbourne; *South Australia*, Dr. Neville P. Wilson, 178 North Terrace, Adelaide; *Western Australia*, Dr. Ross Robinson, 205 St. George's Terrace, Perth; *Tasmania*, Dr. R. A. Lewis, 2 Mawhera Avenue, Sandy Bay, Tasmania; *New Zealand*, Mr. G. Lee, General Secretary, New Zealand Branch of the British Medical Association, Box 156, G.P.O., Wellington.

Personal Note.

Only one previous congress has been held at Brisbane, in 1920. On that occasion Sir Henry Maudsley was president of the Section of Neurology and Psychological Medicine. In 1950 his son, Dr. Henry F. Maudsley, M.C., will be president of the same section.

Obituary.

WILLIAM HORNER NELSON.

WILLIAM HORNER NELSON, who was born at Grahamstown, South Africa, was a student in medicine at the University of Edinburgh when the South African War broke out. He fought with the British forces in the South African campaign at the age of twenty years. After this campaign he came to Australia on medical advice because of his poor health. He recommenced his medical course at the University of Melbourne and qualified, receiving the degrees of Bachelor of Medicine and Bachelor of Surgery in 1907. Moving to Western Australia, he became a resident medical officer at the Perth Hospital. From 1910 to 1916 he carried on private practice at Greenbushes, and then practised in Perth until his retirement in 1946. During the recent war, in addition to maintaining his busy practice, he carried out military duties. A keen philatelist, he displayed a portion of his

DISEASES NOTIFIED IN EACH STATE AND TERRITORY OF AUSTRALIA FOR THE WEEK ENDED SEPTEMBER 3, 1949.[1]

Disease.	New South Wales.	Victoria[4].	Queensland.	South Australia.	Western Australia.	Tasmania.	Northern Territory.[2]	Australian Capital Territory.	Australia.[3]
Ankylostomiasis	*	..	1	..	*	..	..	..	1
Anthrax	*	..	..	..	..	..	..	..	..
Beriberi	*	*	*	*	*	*	..	*	..
Bilharziasis	*	..	..	..	..	..	..	..	..
Cerebro-spinal Meningitis	..	..	..	1	..	..	..	..	1
Cholera	..	..	..	..	..	..	..	..	..
Coastal Fever(*a*)	*	*	..	*	*	*	*	*	..
Dengue	*	*	*	*	*	*	..	*	..
Diarrhœa (Infantile)	..	..	7(5)	..	3	..	..	..	10
Diphtheria	6(6)	5(3)	4	..	5(3)	..	..	..	20
Dysentery(*b*)	*	..	6(6)	..	..	..	..	..	6
Encephalitis Lethargica	..	..	..	..	..	..	..	..	..
Erysipelas	*	*	*	2(2)	*	*	..	..	2
Filariasis	*	..	..	..	..	..	..	..	..
Helminthiasis	*	..	*	*	*	*	*	*	..
Hydatid	*	2	*	*	..	*	*	..	2
Influenza	*	*	*	..	*	*	..	*	..
Leprosy	..	..	..	..	5	..	..	..	5
Malaria(*c*)	*	(*c*)	1(*c*)	(*c*)	(*c*)	(*c*)	(*c*)	(*c*)	1(*c*)
Measles	*	*	*	141(29)	*	*	..	..	141
Plague	..	..	..	..	..	..	..	..	..
Poliomyelitis	3(2)	37(28)	1	11(11)	2(1)	..	..	..	54
Psittacosis	*	..	*	..	*	*	*	*	..
Puerperal Fever	1	..	1(1)	..	..	..	..	..	2
Rubella	*	..	*	*	3(2)	*	..	..	3
Scarlet Fever	35(23)	30(11)	12(2)	9(7)	1(1)	3	..	..	90
Smallpox	..	..	..	..	..	..	..	..	..
Tetanus	*	..	..	*	*	*	*	*	..
Trachoma	*	*	*	*	*	*	*	*	..
Tuberculosis(*d*)	21(15)	11(8)	3	6(6)	2	5(4)	..	..	48
Typhoid Fever(*e*)	..	..	..	..	..	..	..	..	..
Typhus (Endemic)(*f*)	..	..	3(1)	..	1(1)	..	..	..	4
Undulant Fever	..	..	..	..	..	..	..	..	..
Weil's Disease(*g*)	*	*	..	*	*	*	*	*	..
Whooping Cough	*	*	*	45(14)	*	*	..	..	45
Yellow Fever	..	..	..	..	..	..	..	..	..

[1] The form of this table is taken from the *Official Year Book of the Commonwealth of Australia*, Number 36, 1944-1945. Figures in parentheses are those for the metropolitan area.
[2] Figures not available.
[3] Figures incomplete owing to absence of returns from the Northern Territory.
[4] Figures for Victoria for the week ended August 27, 1949, which arrived too late for publication in the previous issue, included the following: poliomyelitis 36(24); scarlet fever 52(18); tuberculosis 21(14).
* Not notifiable.
(*a*) Includes "Mossman" and "Sarina" fevers. (*b*) Includes amœbic and bacillary. (*c*) Statistics inexact with varying practice with regard to relapses in Service cases infected overseas. (*d*) Includes all forms except in New South Wales and Northern Territory, where only pulmonary tuberculosis is notifiable. (*e*) Includes enteric fever, paratyphoid fevers and other Salmonella infections. (*f*) Cases reported include scrub, murine and tick typhus. (*g*) Includes leptospiroses, Weil's and para-Weil's disease.

extensive stamp collection in the hobbies exhibition at the 1948 medical congress. He was always a staunch supporter of the British Medical Association and was a member at the time of his death.

Dr. F. W. Carter writes: Although not altogether unexpected, Dr. Nelson's death on August 17, 1949, came as a shock to his many friends inside and outside the profession; he had been in the city all day and collapsed as he entered his home in the early evening and died a few hours later. I leave it to others to give an account of his academic and military achievements and would write only about the colleague and friend with whom I was closely associated for more than a quarter of a century, and particularly during the war with its strain and stress of gross overwork, a time apt to bring out the best—or the worst—in people; in my friend, it brought out the best. His strict observance of the spirit and the letter of the protection of practices of his colleagues on active service was absolute and it never wavered. He combined great modesty with quiet self-assurance and dignity and a refreshing sense of humour that was a joy to all with whom he came in contact; his patients welcomed him and their outlook was made the brighter by his visit. When failing health forced his retirement from active practice, its immediate effect was merely a change from family doctor to family friend and adviser, and he retained this position in the hearts and minds of his erstwhile patients until his death. During an illness of some weeks' duration a year ago, I was made deeply conscious of his kindly personality and cheery optimism, as he so generously gave of its time from day to day, and of his eagerness to assume responsibilities for which he was physically unfit. Bill Nelson loved his fellow man and will long be remembered for a complete self-abnegation in both his private and his professional life; he was in truth the "good physician".

ERNEST WILLIAM GRIFFITHS.

WE regret to announce the death of Dr. Ernest William Griffiths, which occurred on September 12, 1949, at Sydney.

ROBERT WREYFORD LAWRENCE.

WE regret to announce the death of Dr. Robert Wreyford Lawrence, which occurred on September 4, 1949, at Hobart.

WINIFRED HARRIET CORKE.

WE regret to announce the death of Dr. Winifred Harriet Corke, which occurred on September 6, 1949, at Melbourne.

ROBERT SCOTT CALLANDER.

WE regret to announce the death of Dr. Robert Scott Callander, which occurred on September 5, 1949, at Elwood, Victoria.

Nominations and Elections.

THE undermentioned has applied for election as a member of the New South Wales Branch of the British Medical Association:

Fox, Noel Louis, M.B., B.S., 1936 (Univ. Sydney), Broken Bay Road, Ettalong, New South Wales.

Medical Appointments.

The following appointments have been made under the provisions of *The Tuberculosis Act*, 1949, Tasmania: as a Medical Board for Hobart—Dr. G. A. Robbie, Dr. T. C. Butler and Dr. N. B. G. Abbott; as a Medical Board for Launceston—Dr. R. Wall, Dr. J. L. Grove and Dr. F. R. T. Stevens.

Dr. L. L. Grimmett has been appointed medical officer, Brisbane Mental Hospital, Goodna, in pursuance of the provisions of *The Mental Hygiene Acts of* 1938 of Queensland.

John Gardner McGlashan has been appointed Quarantine Officer under the *Quarantine Act*, 1908-1947.

Patrick John Reilly, Edward Burton Gunson, Moses Sendak, Robert George Mair, Alfred Henry Humphry, Gordon Alfred William Pryor, Charles Mervyn Deland and Bertram Edward Welton have been appointed Quarantine Officers (Northern Territory) under the *Quarantine Act*, 1908-1947.

Diary for the Month.

SEPT. 27.—New South Wales Branch, B.M.A.: Ethics Committee.
SEPT. 28.—Victorian Branch, B.M.A.: Council Meeting.
SEPT. 29.—South Australian Branch, B.M.A.: Branch Meeting.
SEPT. 29.—New South Wales Branch, B.M.A.: Branch Meeting.
SEPT. 30.—New South Wales Branch, B.M.A.: Annual Meeting.
OCT. 4.—New South Wales Branch, B.M.A.: Council Quarterly.

Medical Appointments: Important Notice.

MEDICAL PRACTITIONERS are requested not to apply for any appointment mentioned below without having first communicated with the Honorary Secretary of the Branch concerned, or with the Medical Secretary of the British Medical Association, Tavistock Square, London, W.C.1.

New South Wales Branch (Honorary Secretary, 135 Macquarie Street, Sydney): Ashfield and District United Friendly Societies' Dispensary; Balmain United Friendly Societies' Dispensary; Leichhardt and Petersham United Friendly Societies' Dispensary; Manchester United Medical and Dispensing Institute, Oxford Street, Sydney; North Sydney Friendly Societies' Dispensary Limited; People's Prudential Assurance Company Limited; Phœnix Mutual Provident Society.

Victorian Branch (Honorary Secretary, Medical Society Hall, East Melbourne): Associated Medical Services Limited; all Institutes or Medical Dispensaries; Australian Prudential Association, Proprietary, Limited; Federated Mutual Medical Benefit Society; Mutual National Provident Club; National Provident Association; Hospital or other appointments outside Victoria.

Queensland Branch (Honorary Secretary, B.M.A. House, 225 Wickham Terrace, Brisbane, B.17): Brisbane Associated Friendly Societies' Medical Institute; Bundaberg Medical Institute. Members accepting LODGE appointments and those desiring to accept appointments to any COUNTRY HOSPITAL or position outside Australia are advised, in their own interests, to submit a copy of their Agreement to the Council before signing.

South Australian Branch (Honorary Secretary, 178 North Terrace, Adelaide): All Lodge appointments in South Australia; all Contract Practice appointments in South Australia.

Western Australian Branch (Honorary Secretary, 205 Saint George's Terrace, Perth): Wiluna Hospital; all Contract Practice appointments in Western Australia. All government appointments with the exception of those of the Department of Public Health.

Editorial Notices.

MANUSCRIPTS forwarded to the office of this journal cannot under any circumstances be returned. Original articles forwarded for publication are understood to be offered to THE MEDICAL JOURNAL OF AUSTRALIA alone, unless the contrary be stated.

All communications should be addressed to the Editor, THE MEDICAL JOURNAL OF AUSTRALIA, The Printing House, Seamer Street, Glebe, New South Wales. (Telephones: MW 2651-2.)

Members and subscribers are requested to notify the Manager, THE MEDICAL JOURNAL OF AUSTRALIA, Seamer Street, Glebe, New South Wales, without delay, of any irregularity in the delivery of this journal. The management cannot accept any responsibility or recognize any claim arising out of non-receipt of journals unless such notification is received within one month.

SUBSCRIPTION RATES.—Medical students and others not receiving THE MEDICAL JOURNAL OF AUSTRALIA in virtue of membership of the Branches of the British Medical Association in the Commonwealth can become subscribers to the journal by applying to the Manager or through the usual agents and booksellers. Subscriptions can commence at the beginning of any quarter and are renewable on December 31. The rate is £3 *per annum* within Australia and the British Commonwealth of Nations, and £4 10s. *per annum* within America and foreign countries, payable in advance.